



User Guide

Type 6339, 6341, 6342, 6346, 6347, 6348

Type 2256, 2257



**Note**

Before using this information and the product it supports, be sure to read the "Safety Information" on page v and "Appendix E. Notices and trademarks" on page 69.

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## Safety Information

### DANGER

Electrical current from power, telephone, and communication cables is hazardous.

To avoid a shock hazard:

- Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.
- Connect all power cords to a properly wired and grounded electrical outlet.
- Connect to properly wired outlets any equipment that will be attached to this product.
- When possible, use one hand only to connect or disconnect signal cables.
- Never turn on any equipment when there is evidence of fire, water, or structural damage.
- Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.
- Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.

<b>To connect:</b> <ol style="list-style-type: none"><li>1. Turn everything OFF.</li><li>2. First, attach all cables to devices.</li><li>3. Attach signal cables to connectors.</li><li>4. Attach power cords to outlet.</li><li>5. Turn device ON.</li></ol>	<b>To disconnect:</b> <ol style="list-style-type: none"><li>1. Turn everything OFF.</li><li>2. First, remove power cords from outlet.</li><li>3. Remove signal cables from connectors.</li><li>4. Remove all cables from devices.</li></ol>
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### DANGER

Le courant électrique provenant de l'alimentation, du téléphone et des câbles de transmission peut présenter un danger.

Pour éviter tout risque de choc électrique :

- Ne manipulez aucun câble et n'effectuez aucune opération d'installation, d'entretien ou de reconfiguration de ce produit au cours d'un orage.
- Branchez tous les cordons d'alimentation sur un socle de prise de courant correctement câblé et mis à la terre.
- Branchez sur des socles de prise de courant correctement câblés tout équipement connecté à ce produit.
- Lorsque cela est possible, n'utilisez qu'une seule main pour connecter ou déconnecter les câbles d'interface.;
- Ne mettez jamais un équipement sous tension en cas d'incendie ou d'inondation, ou en présence de dommages matériels.
- Avant de retirer les carters de l'unité, mettez celle-ci hors tension et déconnectez ses cordons d'alimentation, ainsi que les câbles qui la relient aux

réseaux, aux systèmes de télécommunication et aux modems (sauf instruction contraire mentionnée dans les procédures d'installation et de configuration).

- Lorsque vous installez, que vous déplacez, ou que vous manipulez le présent produit ou des périphériques qui lui sont raccordés, reportez-vous aux instructions ci-dessous pour connecter et déconnecter les différents cordons.

Connexion:	Déconnexion:
1. Mettez les unités hors tension.	1. Mettez les unités hors tension.
2. Commencez par brancher tous les cordons sur les unités.	2. Débranchez les cordons d'alimentation des prises.
3. Branchez les câbles d'interface sur des connecteurs.	3. Débranchez les câbles d'interface des connecteurs.
4. Branchez les cordons d'alimentation sur des prises.	4. Débranchez tous les câbles des unités.
5. Mettez les unités sous tension.	

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## Lithium battery notice

### CAUTION:

Danger of explosion if battery is incorrectly replaced.

When replacing the battery, use only IBM Part Number 33F8354 or an equivalent type battery recommended by the manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

### *Do not:*

- Throw or immerse into water
- Heat to more than 100°C (212°F)
- Repair or disassemble

Dispose of the battery as required by local ordinances or regulations.

### ATTENTION

Danger d'explosion en cas de remplacement incorrect de la batterie.

Remplacer uniquement par une batterie IBM de type ou d'un type équivalent recommandé par le fabricant. La batterie contient du lithium et peut exploser en cas de mauvaise utilisation, de mauvaise manipulation ou de mise au rebut inappropriée.

### *Ne pas :*

- Lancer ou plonger dans l'eau
- Chauffer à plus de 100°C (212°F)
- Réparer ou désassembler

Mettre au rebut les batteries usagées conformément aux règlements locaux.

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## Modem safety information

To reduce the risk of fire, electrical shock, or injury when using telephone equipment, always follow basic safety precautions, such as:

- Never install telephone wiring during a lightning storm.

- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.
- Avoid using a telephone (other than a cordless type) during an electrical storm. There may be a remote risk of electric shock from lightning.
- Do not use the telephone to report a gas leak in the vicinity of the leak.

### Consignes de sécurité relatives au modem

Lors de l'utilisation de votre matériel téléphonique, il est important de respecter les consignes ci-après afin de réduire les risques d'incendie, d'électrocution et d'autres blessures :

- N'installez jamais de cordons téléphoniques durant un orage.
- Les prises téléphoniques ne doivent pas être installées dans des endroits humides, excepté si le modèle a été conçu à cet effet.
- Ne touchez jamais un cordon téléphonique ou un terminal non isolé avant que la ligne ait été déconnectée du réseau téléphonique.
- Soyez toujours prudent lorsque vous procédez à l'installation ou à la modification de lignes téléphoniques.
- Si vous devez téléphoner pendant un orage, pour éviter tout risque de choc électrique, utilisez toujours un téléphone sans fil.
- En cas de fuite de gaz, n'utilisez jamais un téléphone situé à proximité de la fuite.

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## Laser compliance statement

Some IBM Personal Computer models are equipped from the factory with a CD-ROM drive or a DVD-ROM drive. CD-ROM drives and DVD-ROM drives are also sold separately as options. CD-ROM drives and DVD-ROM drives are laser products. These drives are certified in the U.S. to conform to the requirements of the Department of Health and Human Services 21 Code of Federal Regulations (DHHS 21 CFR) Subchapter J for Class 1 laser products. Elsewhere, these drives are certified to conform to the requirements of the International Electrotechnical Commission (IEC) 825 and CENELEC EN 60 825 for Class 1 laser products.

When a CD-ROM drive or a DVD-ROM drive is installed, note the following handling instructions.

### CAUTION:

**Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

Removing the covers of the CD-ROM drive or DVD-ROM drive could result in exposure to hazardous laser radiation. There are no serviceable parts inside the CD-ROM drive or DVD-ROM drive. **Do not remove the drive covers.**

Some CD-ROM drives and DVD-ROM drives contain an embedded Class 3A or Class 3B laser diode. Note the following statement.



**DANGER**

**Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.**

**DANGER:**

Certains modèles d'ordinateurs personnels sont équipés d'origine d'une unité de CD-ROM ou de DVD-ROM. Mais ces unités sont également vendues séparément en tant qu'options. L'unité de CD-ROM/DVD-ROM est un appareil à laser. Aux États-Unis, l'unité de CD-ROM/DVD-ROM est certifiée conforme aux normes indiquées dans le sous-chapitre J du DHHS 21 CFR relatif aux produits à laser de classe 1. Dans les autres pays, elle est certifiée être un produit à laser de classe 1 conforme aux normes CEI 825 et CENELEC EN 60 825.

Lorsqu'une unité de CD-ROM/DVD-ROM est installée, tenez compte des remarques suivantes:

**ATTENTION: Pour éviter tout risque d'exposition au rayon laser, respectez les consignes de réglage et d'utilisation des commandes, ainsi que les procédures décrites.**

L'ouverture de l'unité de CD-ROM/DVD-ROM peut entraîner un risque d'exposition au rayon laser. Pour toute intervention, faites appel à du personnel qualifié.

Certaines unités de CD-ROM/DVD-ROM peuvent contenir une diode à laser de classe 3A ou 3B. Tenez compte de la consigne qui suit:

**DANGER**

**Rayonnement laser lorsque le carter est ouvert. Évitez toute exposition directe des yeux au rayon laser. Évitez de regarder fixement le faisceau ou de l'observer à l'aide d'instruments optiques.**

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## About this book

This publication provides instructions for installing most options into your computer. This publication also includes an overview of computer features, locating connectors, and updating configuration settings.

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## How this book is organized

This book contains the following chapters and appendixes:

- “Chapter 1. Overview“ provides an introduction to the computer specifications and the options that are available for your computer.
- “Chapter 2. Installing external options“ provides information to orient you to the connectors on your computer and instructions for installing external options and peripheral devices.
- “Chapter 3. Installing internal options — small desktop model“ provides instructions for removing the cover and installing hard disk drives, memory, and adapters in your computer.
- “Chapter 4. Installing internal options — desktop model“ provides instructions for removing the cover and installing hard disk drives, memory, and adapters in your computer.
- “Chapter 5. Installing internal options — microtower model“ provides instructions for removing the cover and installing hard disk drives, memory, and adapters in your computer.
- “Chapter 6. Updating the computer configuration“ provides instructions for updating the computer configuration, installing device drivers, and erasing a lost or forgotten password.
- “Appendix A. Changing the battery“ provides instructions to help you change the battery if you need to.
- “Appendix B. Updating System Programs“ provides instructions to help you update your system programs.
- “Appendix C. System address maps“ provides information for programmers describing the address maps of the computer.
- “Appendix D. Interrupt request and direct memory access channel assignments“ provides information about the interrupt and direct memory access channel assignments.
- “Appendix E. Notices and trademarks“ contains notice and trademark information.

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## Information resources

Access IBM, on your desktop, provides a link to more information about your computer.

See the *Quick Reference* that comes with your computer for basic troubleshooting, software recovery procedures, and information about where to call for help and service.

If you have Internet access, the most up-to-date manuals for your computer are available from the World Wide Web. To access this information, point your browser to:

<http://www.pc.ibm.com/support>

Type your machine type and model number in the **Quick Path** field, and click **Go**.

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## Chapter 1. Overview

Adding hardware options to your computer is an easy way to increase its capabilities. Instructions for installing external and internal options are included in this publication. When adding an option, use these instructions along with the instructions that come with the option.

This chapter provides a brief introduction to the options and features that are available for your computer. Also, important information about required tools, electrical safety, and static-sensitive devices is included.

**Important**

Before you install any option, read “Safety Information” on page v. These precautions and guidelines will help you work safely.

See Access IBM for general information about the use, operation, and maintenance of your computer. Access IBM also contains information to help you solve problems and get repair service or other technical assistance.

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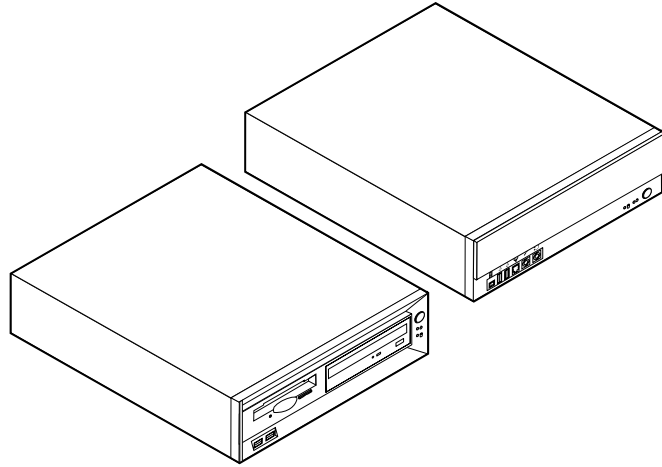
### Identifying your computer

To properly install options, you will need to know the machine type/model of your computer. You can find this number on the small label on the front of your computer. An example of the machine type/model number is 6339xxx.

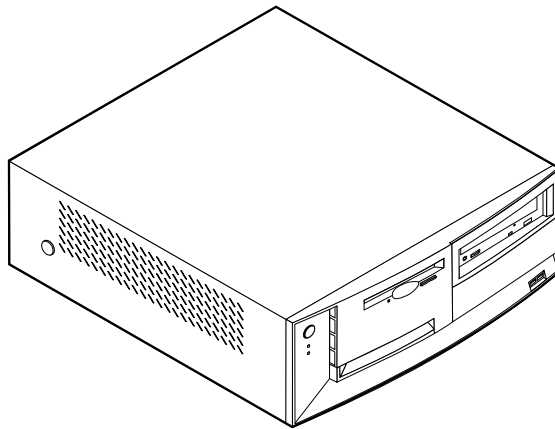
The information in this publication supports several computer types and models. The following illustrations will help you identify your computer.

## Small desktop model computer

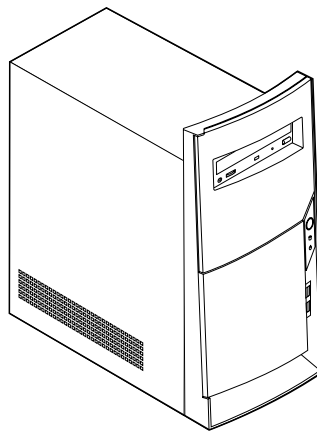
**Note:** The following illustration shows two types of small desktop model computers. One model type has a door covering the drives.



## Desktop model computer



## Microtower model computer



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## Features

This section provides an overview of the computer features, preinstalled software, and specifications.

### Microprocessor

Intel® Pentium™ III with 256 KB of internal L2 cache memory and MMX™ technology or an Intel Celeron™ with 128 KB of internal L2 cache memory and MMX technology

### Memory

- Support for two dual in-line memory modules (DIMMs)
- 512 KB flash memory for system programs

### Internal drives

- 3.5-inch, 1.44 MB diskette drive (some models)
- Internal hard disk drive
- EIDE CD drive or DVD drive (some models)

### Video controller

Dynamic video memory technology

### Audio subsystem

16-bit integrated Sound Blaster Pro compatible audio subsystem

### Connectivity

- 10/100 Mbps integrated Ethernet controller that supports the Wake on LAN® feature
- Modem (some models)

### System management features

- Remote Program Load (RPL) and Dynamic Host Configuration Protocol (DHCP)
- Wake on LAN
- Wake on Ring (in the Configuration/Setup Utility program, this feature is called Serial Port Ring Detect for an external modem and Modem Ring Detect for an internal modem)
- Remote Administration
- Automatic power-on startup
- System Management (SM) BIOS and SM software
- Ability to store POST hardware test results

### Input/output features

- 25-pin, Extended Capabilities Port (ECP)/Extended Parallel Port (EPP)
- Two 9-pin serial connectors
- Four 4-pin, USB connectors
- PS/2® mouse connector
- PS/2 keyboard connector
- Ethernet connector
- Monitor connector
- Three audio connectors (line in, line out, and microphone)

- Front connectors on some small desktops (S/PDIF, microphone, and headphone)
- Front IEEE 1394 connector (some small desktop models)

### **Expansion**

- Drive bays
  - Small desktop model: Three
  - Desktop model: Four
  - Microtower model: Four
- 32-bit PCI expansion slots
  - Small desktop model: Three (expansion cards must be low profile)
  - Desktop model: Three
  - Microtower model: Three

### **Power**

- 95 W, 120 W, or 155 W power supply with manual voltage selection switch
- Automatic 50/60 Hz input frequency switching
- Advanced Power Management support
- Advanced Configuration and Power Interface (ACPI) support

### **Security features**

- Power-on and administrator passwords
- Support for the addition of a Rope Clip and lockable cable (varies by mechanical chassis)
- Startup sequence control
- Startup without diskette drive, keyboard, or mouse
- Unattended start mode
- Diskette and hard disk I/O control
- Serial and parallel port I/O control
- Security profile by device

### **IBM preinstalled software**

Your computer might come with preinstalled software. If it does, an operating system, device drivers to support built-in features, and other support programs are included.

### **Operating systems (supported)**

- Microsoft® Windows® Millennium Edition (Me)
- Microsoft Windows 2000 Professional
- Microsoft Windows 98 Second Edition

### **Operating systems (tested for compatibility)<sup>1</sup>**

- Microsoft Windows 95
- Microsoft Windows NT® Workstation Version 4.0
- Microsoft Windows XP Personal

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1. The operating systems listed here are being tested for compatibility at the time this publication goes to press. Additional operating systems might be identified by IBM as compatible with your computer following the publication of this booklet. Corrections and additions to this list are subject to change. To determine if an operating system has been tested for compatibility, check the Web site of the operating system vendor.

## Specifications

This section lists the physical specifications for your computer.

### Physical specification — small desktop model

<p><b>Dimensions</b></p> <p>Height: 88 mm (3.4 in.) Width: 305 mm (12.0 in.) Depth: 380 mm (14.9 in.)</p> <p><b>Weight</b></p> <p>Minimum configuration as shipped: 8.5 kg (18 lb) Maximum configuration: 8.6 kg (19 lb)</p> <p><b>Environment</b></p> <p>Air temperature: System on: 10° to 35° C (50° to 95° F) System off: 10° to 43° C (50° to 110° F) Maximum altitude: 2134 m (7000 ft) <b>Note:</b> The maximum altitude, 2134 m (7000 ft), is the maximum altitude at which the specified air temperatures apply. At higher altitudes, the maximum air temperatures are lower than those specified.</p> <p>Humidity: System on: 8% to 80% System off: 8% to 80%</p> <p><b>Electrical input</b></p> <p>Input voltage: Low range: Minimum: 90 V ac Maximum: 137 V ac Input frequency range: 57–63 Hz Voltage switch setting: 115 V ac High range: Minimum: 180 V ac Maximum: 265 V ac Input frequency range: 47–53 Hz Voltage switch setting: 230 V ac</p> <p>Input kilovolt-amperes (kVA) (approximate): Minimum configuration as shipped: 0.08 kVA Maximum configuration: 0.30 kVA</p> <p><b>Note:</b> Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use.</p>	<p><b>Heat output</b> (approximate) in British thermal units (Btu) per hour: Minimum configuration: 205 Btu/hr (60 watts) Maximum configuration: 375 Btu/hr (120 watts)</p> <p><b>Airflow</b></p> <p>Approximately 0.25 cubic meters per minute (9 cubic feet per minute) maximum</p> <p><b>Acoustical noise-emission values</b></p> <p>Average sound-pressure levels: At operator position: Idle: 38 dBA Operating: 43 dBA At bystander position - 1 meter (3.3 ft): Idle: 33 dBA Operating: 37 dBA</p> <p>Declared (upper limit) sound-power levels: Idle: 3.75 bels Operating: 4.99 bels</p> <p><b>Note:</b> These levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average values stated because of room reflections and other nearby noise sources. The declared sound-power levels indicate an upper limit, below which a large number of computers will operate. <b>Note:</b> The computer is classified as a Class A or Class B digital device. See the <i>Quick Reference</i> for further information about this classification.</p>
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## Physical specification — desktop model

<p><b>Dimensions</b></p> <p>Height: 140 mm (5.5 in.) Width: 425 mm (16.7 in.) Depth: 425 mm (16.7 in.)</p> <p><b>Weight</b></p> <p>Minimum configuration as shipped: 14.0 kg (30 lb) Maximum configuration: 17.3 kg (25.0 lb)</p> <p><b>Environment</b></p> <p>Air temperature: System on: 10° to 35° C (50° to 95° F) System off: 10° to 43° C (50° to 110° F) Maximum altitude: 2134 m (7000 ft) <b>Note:</b> The maximum altitude, 2134 m (7000 ft), is the maximum altitude at which the specified air temperatures apply. At higher altitudes, the maximum air temperatures are lower than those specified.</p> <p>Humidity: System on: 8% to 80% System off: 8% to 80%</p> <p><b>Electrical input</b></p> <p>Input voltage: Low range: Minimum: 90 V ac Maximum: 137 V ac Input frequency range: 57–63 Hz Voltage switch setting: 115 V ac High range: Minimum: 180 V ac Maximum: 265 V ac Input frequency range: 47–53 Hz Voltage switch setting: 230 V ac</p> <p>Input kilovolt-amperes (kVA) (approximate): Minimum configuration as shipped: 0.08 kVA Maximum configuration: 0.3 kVA</p> <p><b>Note:</b> Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use.</p>	<p><b>Heat output</b> (approximate) in British thermal units (Btu) per hour: Minimum configuration: 240 Btu/hr (75 watts) Maximum configuration: 940 Btu/hr (160 watts)</p> <p><b>Airflow</b></p> <p>Approximately 0.34 cubic meters per minute (12 cubic feet per minute) maximum</p> <p><b>Acoustical noise-emission values</b></p> <p>Average sound-pressure levels: At operator position: Idle: 38 dBA Operating: 43 dBA At bystander position - 1 meter (3.3 ft): Idle: 33 dBA Operating: 37 dBA</p> <p>Declared (upper limit) sound-power levels: Idle: 4.8 bels Operating: 5.1 bels</p> <p><b>Note:</b> These levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average values stated because of room reflections and other nearby noise sources. The declared sound-power levels indicate an upper limit, below which a large number of computers will operate. <b>Note:</b> The computer is classified as a Class A or Class B digital device. See the <i>Quick Reference</i> for further information about this classification.</p>
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## Physical specifications — microtower model

<p><b>Dimensions</b></p> <p>Height: 192 mm (7.6 in.)</p> <p>Width: 385 mm (15.2 in.)</p> <p>Depth: 388 mm (15.3 in.)</p> <p><b>Weight</b></p> <p>Minimum configuration as shipped: 9.4 kg (20 lb)</p> <p>Maximum configuration: 11.3 kg (25.0 lb)</p> <p><b>Environment</b></p> <p>Air temperature:</p> <p>System on: 10° to 35° C (50° to 95° F)</p> <p>System off: 10° to 43° C (50° to 110° F)</p> <p>Maximum altitude: 2134 m (7000 ft)</p> <p><b>Note:</b> The maximum altitude, 2134 m (7000 ft), is the maximum altitude at which the specified air temperatures apply. At higher altitudes, the maximum air temperatures are lower than those specified.</p> <p>Humidity:</p> <p>System on: 8% to 80%</p> <p>System off: 8% to 80%</p> <p><b>Electrical input</b></p> <p>Input voltage:</p> <p>Low range:</p> <p>Minimum: 90 V ac</p> <p>Maximum: 137 V ac</p> <p>Input frequency range: 57–63 Hz</p> <p>Voltage switch setting: 115 V ac</p> <p>High range:</p> <p>Minimum: 180 V ac</p> <p>Maximum: 265 V ac</p> <p>Input frequency range: 47–53 Hz</p> <p>Voltage switch setting: 230 V ac</p> <p>Input kilovolt-amperes (kVA) (approximate):</p> <p>Minimum configuration as shipped: 0.08 kVA</p> <p>Maximum configuration: 0.3 kVA</p> <p><b>Note:</b> Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use.</p>	<p><b>Heat output</b> (approximate) in British thermal units (Btu) per hour:</p> <p>Minimum configuration: 240 Btu/hr (75 watts)</p> <p>Maximum configuration: 705 Btu/hr (160 watts)</p> <p><b>Airflow</b></p> <p>Approximately 0.5 cubic meters per minute (18 cubic feet per minute) maximum</p> <p><b>Acoustical noise-emission values</b></p> <p>Average sound-pressure levels:</p> <p>At operator position:</p> <p>Idle: 38 dBA</p> <p>Operating: 43 dBA</p> <p>At bystander position - 1 meter (3.3 ft):</p> <p>Idle: 33 dBA</p> <p>Operating: 37 dBA</p> <p>Declared (upper limit) sound-power levels:</p> <p>Idle: 4.8 bels</p> <p>Operating: 5.1 bels</p> <p><b>Note:</b> These levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average values stated because of room reflections and other nearby noise sources. The declared sound-power levels indicate an upper limit, below which a large number of computers will operate.</p> <p><b>Note:</b> The computer is classified as a Class A or Class B digital device. See the <i>Quick Reference</i> for further information about this classification.</p>
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## Available options

The following are some available options:

- External options
  - Parallel port devices, such as printers and external drives
  - Serial port devices, such as external modems and digital cameras
  - Audio devices, such as external speakers for the sound system
  - USB devices, such as printers, joysticks, and scanners
  - Security device, such as a Rope Clip
  - Monitors
  - IEEE 1394 devices, such as digital cameras
- Internal options
  - System memory, called dual in-line memory modules (DIMMs)
  - Peripheral component interconnect (PCI) adapters
  - Internal drives, such as:
    - CD drive or DVD drive
    - Hard disk
    - Diskette drives and other removable media drives

For the latest information about available options, see the following World Wide Web pages:

- <http://www.ibm.com/pc/us/options/>
- <http://www.pc.ibm.com/support/>

You can also obtain information by calling the following telephone numbers:

- Within the United States, call 1-800-IBM-2YOU (1-800-426-2968), your IBM reseller, or IBM marketing representative.
- Within Canada, call 1-800-565-3344 or 1-800-465-7999.
- Outside the United States and Canada, contact your IBM reseller or IBM marketing representative.

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## Tools required

To install some options in your computer, you might need a flat-blade or a Phillips screwdriver. Additional tools might be needed for certain options. See the instructions that come with the option.

---

## Handling static-sensitive devices

Static electricity, although harmless to you, can seriously damage computer components and options.

When you add an option, do *not* open the static-protective package containing the option until you are instructed to do so.

When you handle options and other computer components, take these precautions to avoid static electricity damage:

- Limit your movement. Movement can cause static electricity to build up around you.
- Always handle components carefully. Handle adapters and memory modules by the edges. Never touch any exposed circuitry.

- Prevent others from touching components.
- When you install a new option, touch the static-protective package containing the option to a metal expansion-slot cover or other unpainted metal surface on the computer for at least two seconds. This reduces static electricity in the package and your body.
- When possible, remove the option and install it directly in the computer without setting the option down. When this is not possible, place the static-protective package that the option came in on a smooth, level surface and place the option on it.
- Do not place the option on the computer cover or other metal surface.



---

## Chapter 2. Installing external options

This chapter shows the various external connectors on your computer to which you can attach external options, such as external speakers, a printer, or a scanner. For some external options, you must install additional software in addition to making the physical connection. When adding an external option, use the information in this chapter to identify the required connector, and then use the instructions that come with the option to help you make the connection and install any software or device drivers that are required for the option.

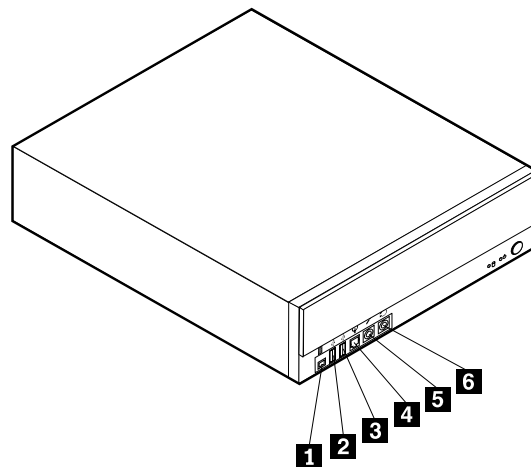
### **Important**

Before you install or remove any option, read “Safety Information” on page v. These precautions and guidelines will help you work safely.

---

### Locating the connectors on the front of your computer

The following illustrations show the location of the connectors on the front of the small desktop computers.



**1** IEEE 1394 connector (some models)

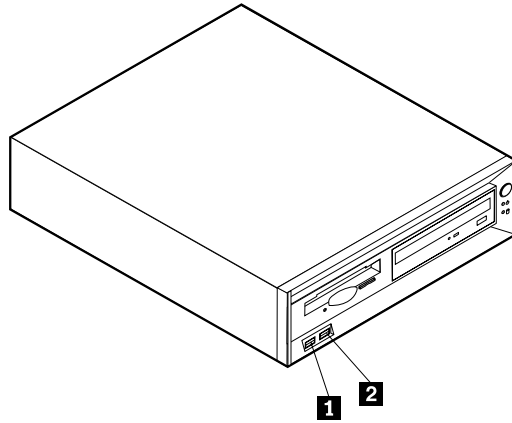
**2** Front USB connector

**3** Front USB connector

**4** S/PDIF connector

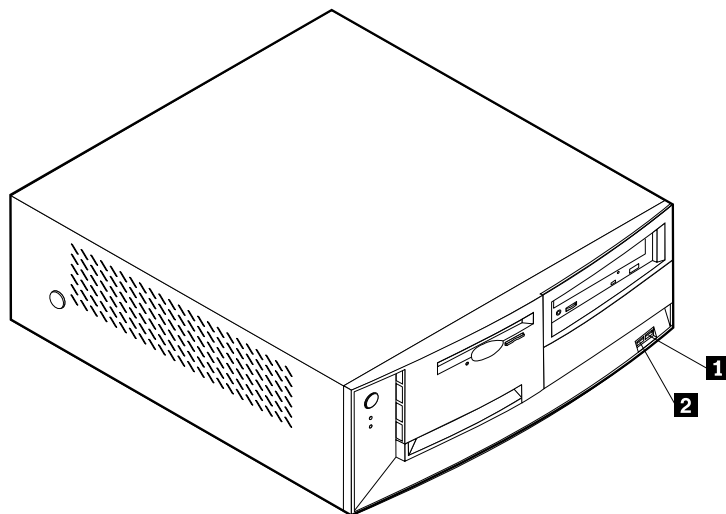
**5** Microphone connector

**6** Headphone connector



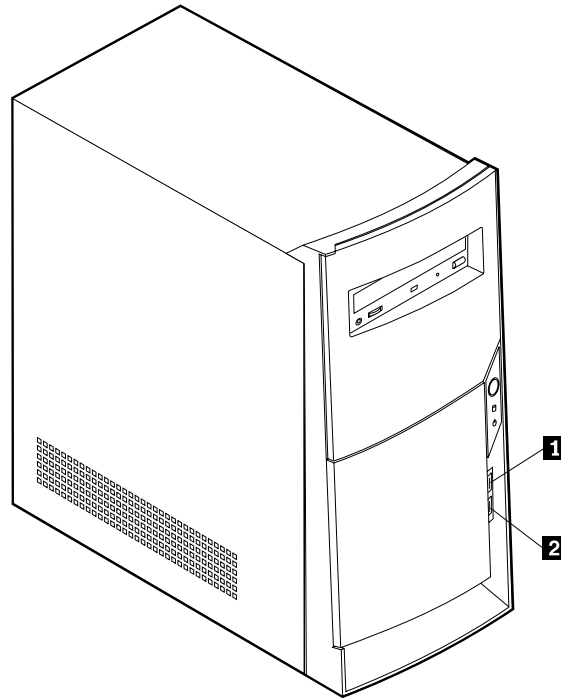
- 1** Front USB connector
- 2** Front USB connector

The following illustration shows the location of the connectors on the front of the desktop computer.



- 1** Front USB connector
- 2** Front USB connector

The following illustration shows the location of the connectors on the front of the microtower computer.



**1** Front USB connector

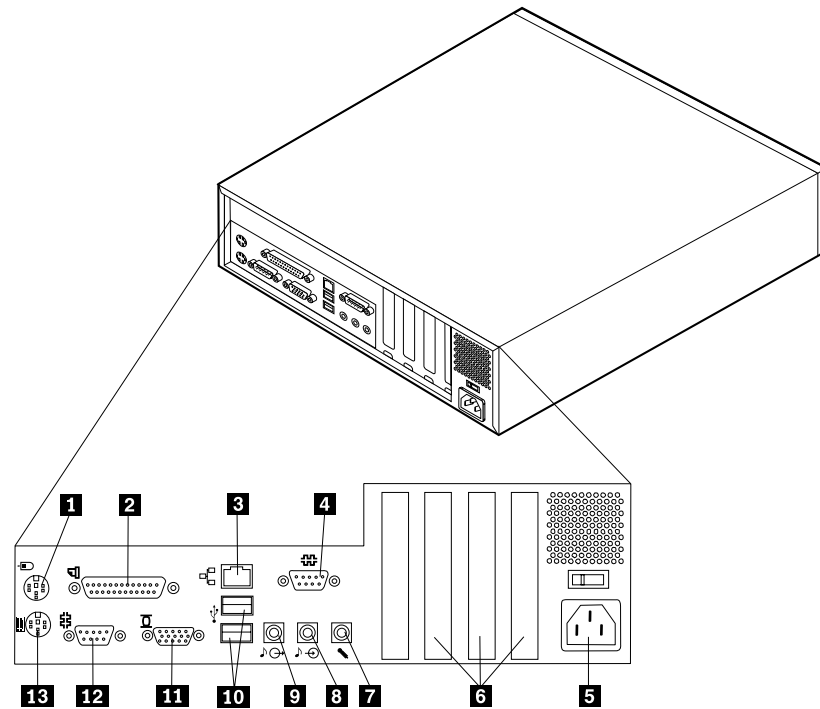
**2** Front USB connector



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## Locating the connectors on the rear of your computer

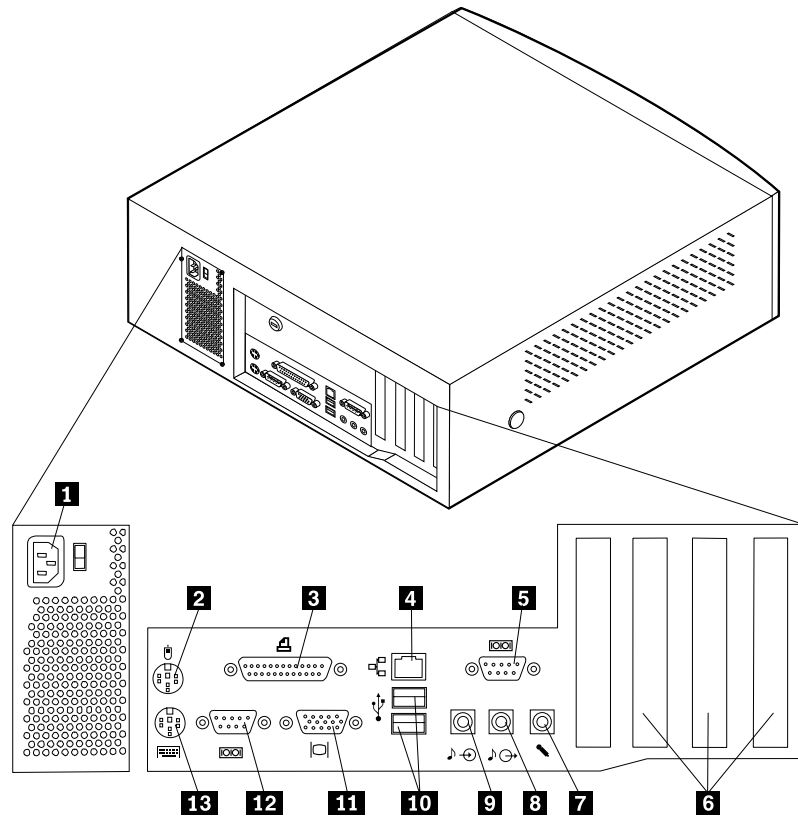
The following illustration shows the location of the connectors on the rear of the small desktop model computer.



- |                               |                                   |
|-------------------------------|-----------------------------------|
| <b>1</b> Mouse connector      | <b>8</b> Audio line in connector  |
| <b>2</b> Parallel connector   | <b>9</b> Audio line out connector |
| <b>3</b> Ethernet connector   | <b>10</b> USB connectors          |
| <b>4</b> Serial connector     | <b>11</b> Monitor connector       |
| <b>5</b> Power connector      | <b>12</b> Serial connector        |
| <b>6</b> PCI slots            | <b>13</b> Keyboard connector      |
| <b>7</b> Microphone connector |                                   |

**Note:** The connectors on the rear of the computer have color-coded icons to help you to determine where to connect the cables on your computer.

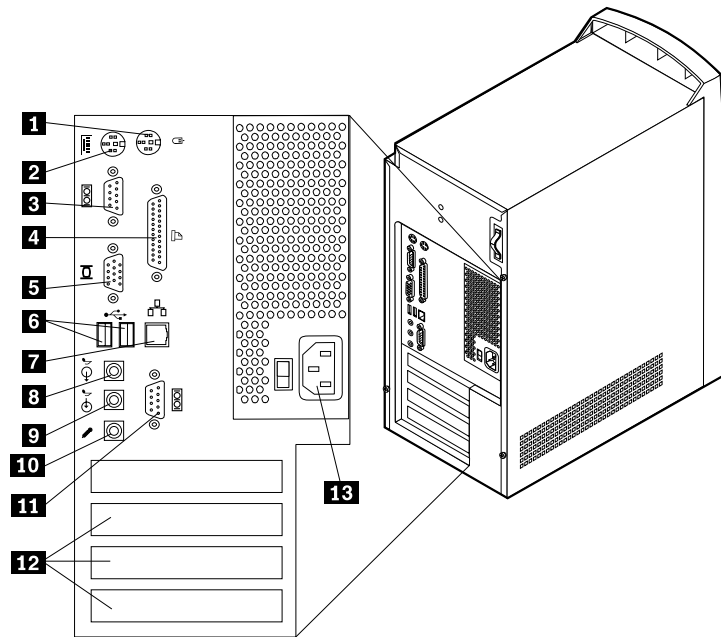
The following illustration shows the location of the connectors on the rear of the desktop model computer.



- |                               |                                   |
|-------------------------------|-----------------------------------|
| <b>1</b> Power connector      | <b>8</b> Audio line in connector  |
| <b>2</b> Mouse connector      | <b>9</b> Audio line out connector |
| <b>3</b> Parallel connector   | <b>10</b> USB connectors          |
| <b>4</b> Ethernet connector   | <b>11</b> Monitor connector       |
| <b>5</b> Serial connector     | <b>12</b> Serial connector        |
| <b>6</b> PCI slots            | <b>13</b> Keyboard connector      |
| <b>7</b> Microphone connector |                                   |

**Note:** The connectors on the rear of the computer have color-coded icons to help you to determine where to connect the cables on your computer.

The following illustration shows the location of the connectors on the back of the microtower model computer.



- |                             |                                   |
|-----------------------------|-----------------------------------|
| <b>1</b> Mouse connector    | <b>8</b> Audio line out connector |
| <b>2</b> Keyboard connector | <b>9</b> Audio line in connector  |
| <b>3</b> Serial connector   | <b>10</b> Microphone connector    |
| <b>4</b> Parallel connector | <b>11</b> Serial connector        |
| <b>5</b> Monitor connector  | <b>12</b> PCI slots               |
| <b>6</b> USB connectors     | <b>13</b> Power connector         |
| <b>7</b> Ethernet connector |                                   |

**Note:** The connectors on the rear of the computer have color-coded icons to help you to determine where to connect the cables on your computer.

Connector	Description
Mouse connector	Used to attach a mouse, trackball, or other pointing device that uses a PS/2 mouse connector.
Keyboard connector	Used to attach a keyboard that uses a PS/2 keyboard connector.
Serial connectors	Used to attach an external modem, serial printer, or other device that uses a 9-pin serial connector.
Parallel connector	Used to attach a parallel printer, parallel scanner, or any other device that requires a 25-pin parallel connection.
USB connectors	Used to attach a device that requires a Universal Serial Bus (USB) connection, such as a USB scanner or USB printer. If you have more than four USB devices, you can purchase a USB hub, which you can use to connect additional USB devices.
Ethernet connector	Used to attach an Ethernet cable that uses an Ethernet connector. <b>Note:</b> To operate the computer within FCC Class A or Class B limits, use a category 5 Ethernet cable.
Audio line out connector	Used to send audio signals from the computer to external devices, such as powered stereo speakers (speakers with built-in amplifiers), headphones (greater than 18 ohms), multimedia keyboards, or the audio line in connector on a stereo system or other external recording device.
Audio line in connector	Used to receive audio signals from an external audio device, such as a stereo system. When you attach an external audio device, a cable is connected between the audio line out connector of the device and the audio line in connector of the computer.
Microphone connector	Used to attach a microphone to your computer when you want to record voice or other sounds on the hard disk using speech-recognition software.

## Home PNA network adapter

Some models might have a Home Phoneline Network Alliance network adapter with an integrated V.90 modem. In addition to its modem function, this adapter enables you to use the telephone wiring in your home for peer-to-peer networking. To use the Home PNA Network adapter, you must install the Intel AnyPoint™ software from the *Software Selections CD*. Each computer on the home PNA network must have a PNA network adapter and the associated software installed. For information about using the PNA network adapter or the AnyPoint software, refer to the AnyPoint documentation (provided with models that come with PNA network adapters only).

Connect each computer on a home PNA network directly to a telephone-line wall connector. If you have more computers than telephone-line wall connectors in a room, use a telephone splitter at the wall connector.

Actual network transfer speeds depend on many factors, such as home wiring configuration, and are often less than the maximum possible.

Some Internet service provider (ISP) accounts do not allow Internet sharing or they charge extra for it. Your ISP access agreement might require you to have more than one account. Check your ISP access agreement for more information.

---

## Obtaining device drivers

You can obtain device drivers for operating systems that are not preinstalled at <http://www.pc.ibm.com/support/> on the World Wide Web. Installation instructions are provided in README files with the device driver files.

---

## Chapter 3. Installing internal options — small desktop model

You can expand the capabilities of your computer by adding memory, drives, or adapters. When installing an option, use these instructions along with the instructions that come with the option.

---

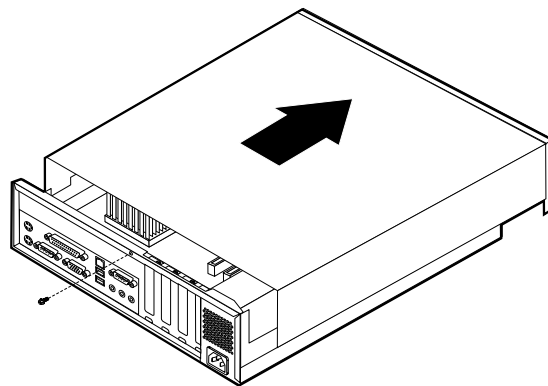
### Removing the cover

**Important**

Read before removing the cover “Safety Information” on page v and “Handling static-sensitive devices” on page 8.

To remove the cover:

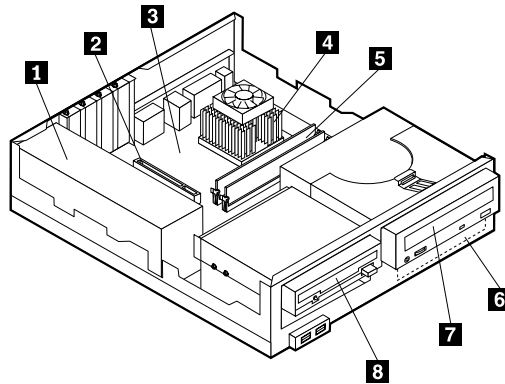
1. Shut down your operating system, remove any media (diskettes, CDs, or tapes) from the drives, and turn off all attached devices and the computer.
2. Unplug all power cords from electrical outlets.
3. Disconnect all cables attached to the computer. This includes power cords, input/output (I/O) cables, and any other cables that are connected to the computer.
4. Remove the screw that secures the top cover at the rear of the system unit.
5. Hold both sides of the system unit top cover and push it forward. Lift the top cover up to remove it completely.



---

## Locating components

The following illustration will help you locate the various components in your computer.



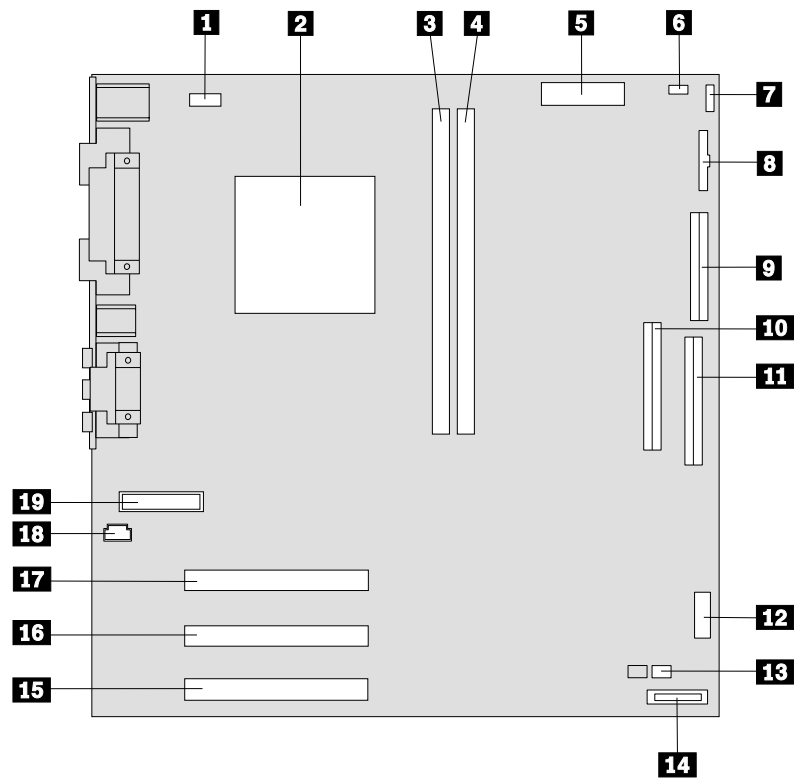
- |                                       |                                |
|---------------------------------------|--------------------------------|
| <b>1</b> Power supply                 | <b>5</b> DIMM                  |
| <b>2</b> PCI slot                     | <b>6</b> Hard disk drive       |
| <b>3</b> System board                 | <b>7</b> CD drive or DVD drive |
| <b>4</b> Microprocessor and heat sink | <b>8</b> Diskette drive        |

---

## Identifying parts on the system board

The system board, also called the *planar* or *motherboard*, is the main circuit board in your computer. It provides basic computer functions and supports a variety of devices that are IBM-installed or that you can install later.

See the following illustration for the location of parts on the system board.



- |                                   |   |
|-----------------------------------|---|
| <b>1</b> Fan connector            | <b>11</b> Primary IDE connector           |
| <b>2</b> Microprocessor           | <b>12</b> Front USB connector             |
| <b>3</b> DIMM 1                   | <b>13</b> Clear CMOS/BIOS recovery jumper |
| <b>4</b> DIMM 2                   | <b>14</b> Battery                         |
| <b>5</b> Power connector          | <b>15</b> PCI slot                        |
| <b>6</b> Power connector          | <b>16</b> PCI slot                        |
| <b>7</b> Hard disk LED connector  | <b>17</b> PCI slot                        |
| <b>8</b> Power LED connector      | <b>18</b> CD-ROM audio connector          |
| <b>9</b> Diskette connector       | <b>19</b> Front panel connector           |
| <b>10</b> Secondary IDE connector |   |

---

## Installing memory

Your computer has two connectors for installing dual in-line memory modules (DIMMs) that provide up to a maximum of 512 MB of system memory.

### Installing DIMMs

When installing DIMMs, the following rules apply:

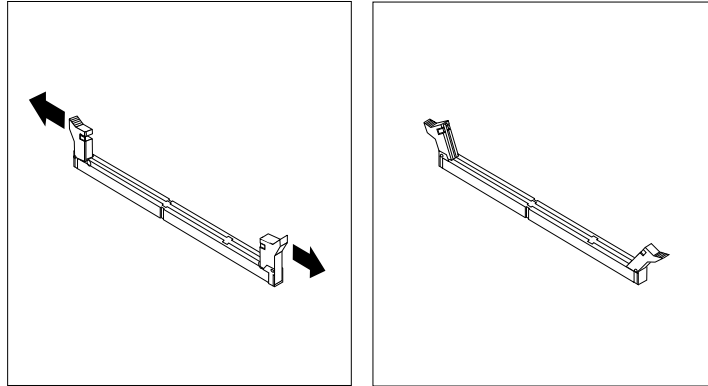
- Fill each system memory connector sequentially, starting at DIMM 1
- Use 3.3 V, synchronous, 168-pin, unbuffered, 133 MHz, nonparity, synchronous dynamic random access memory (SDRAM)
- Use 32 MB, 64 MB, 128 MB, or 256 MB DIMMs in any combination
- DIMM heights of 38.1 mm (1.5 inches)

To install a DIMM:

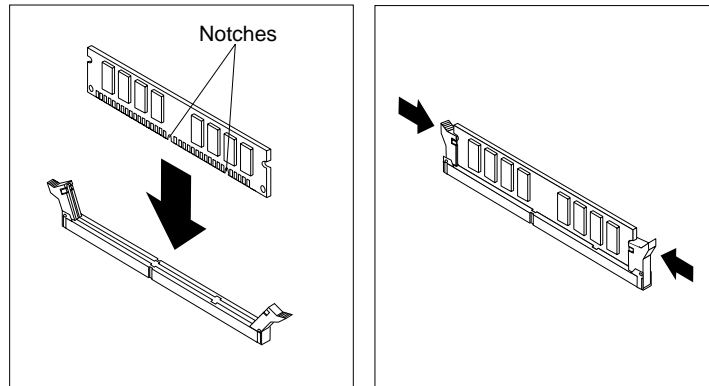
1. Remove the cover. See “Removing the cover” on page 19.



2. To locate the DIMM connectors. See “Identifying parts on the system board” on page 20 .
3. Open the retaining clips.



4. Make sure the notches in the DIMM align with the tabs on the connector. Push or insert the DIMM straight down into the connector until the retaining clips close.



**What to do next:**

- To work with another option, go to the appropriate section.
- To complete the installation, go to “Replacing the cover and connecting the cables” on page 26.

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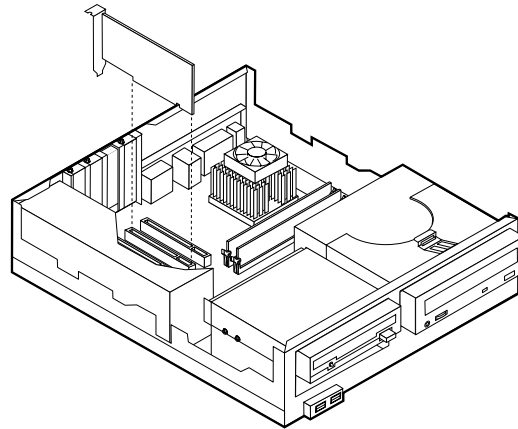
## Installing adapters

This section provides information and instructions for installing and removing adapters. Your computer has three expansion slots for low profile peripheral component interconnect (PCI) adapters.

To install an adapter:

1. Remove the cover. See “Removing the cover” on page 19.

2. Remove the slot screw and slot cover for the appropriate expansion slot.



3. Install the adapter and insert the retaining screw.

**What to do next:**

- To work with another option, go to the appropriate section.
- To complete the installation, go to “Replacing the cover and connecting the cables” on page 26.

---

## Installing internal drives

This section provides information and instructions for installing and removing internal drives.

Internal drives are devices that your computer uses to read and store data. You can add or replace drives in your computer to increase storage capacity and to enable your computer to read other types of media such as CD-ROM.

Internal drives are installed in *bays*. Within this book, the bays are referred to as bay 1, bay 2, and so on.

When you install an internal drive, it is important to note what type and size of drive that you can install in each bay. Also, it is important to correctly connect the internal drive cables to the installed drive.

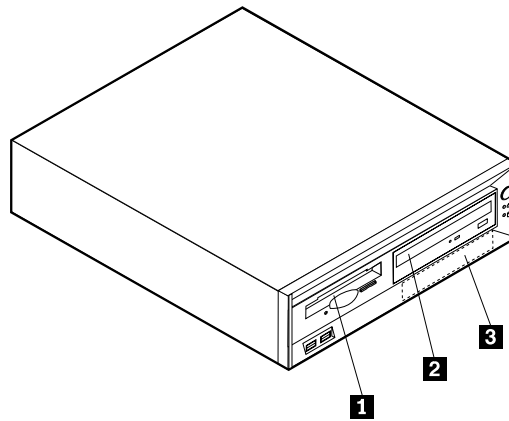
### Drive specifications

Your computer might come with the following IBM-installed drives:

- A 3.5-inch diskette drive in bay 1
- A CD drive or DVD drive in bay 2
- A 3.5-inch hard disk drive in bay 3

Bays that do not have drives installed have a static shield and bay panel installed.

The following illustration shows the locations of the drive bays



The following table describes some of the drives that you can install in each bay and their height requirements.

<b>1</b> Bay 1 - Max Height: 25.4 mm (1.0 in.)	3.5-inch diskette drive (preinstalled in some models)
<b>2</b> Bay 2 - Max Height: 41.3 mm (1.6 in.)	CD-ROM drive (standard in some models)
<b>3</b> Bay 3 - Max Height: 12.7 mm (0.5 in.)	3.5-inch hard disk drive (preinstalled)

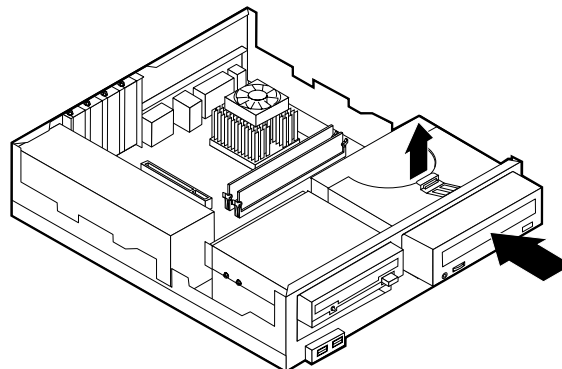
**Notes:**

1. Drives that are greater than 41.3 mm (1.6 in.) high cannot be installed.
2. Install removable media (tape or CD) drives in the accessible bay: bay 1 or 2.

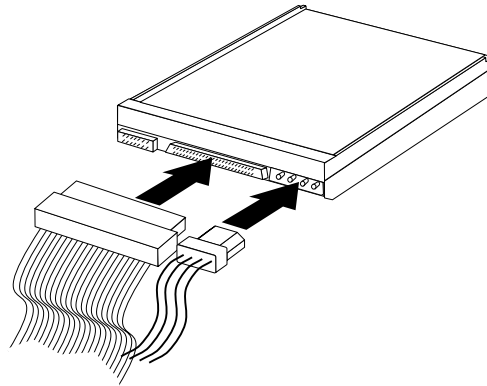
## Installing a drive

To install a CD drive or DVD drive in bay 2, follow these steps.

1. Remove the cover (see “Removing the cover” on page 19).
2. If you are installing a drive with removable media, insert a flat-blade screwdriver into one of the slots on the static shield in the drive bay into which you installed the drive and gently pry the static shield loose from the drive bay.
3. Make sure the drive is set correctly as the master device. Refer to the documentation that comes with your CD drive or DVD drive for master/slave jumper information.
4. Lift the latch and remove the drive mounting tray.
5. Install the drive into the bay. Align the screw holes and insert the four screws.
6. Slide the drive cage halfway into the mounting tray.



7. Each integrated drive electronics (IDE) drive requires two cables; a four-wire power cable that connects to the power supply, and a signal cable that connects to the system board. You might also have an audio cable to connect. To connect a CD drive or DVD drive to your computer, follow these steps.
  - a. Locate the signal cable that came with your computer or with the new drive.
  - b. Locate the secondary IDE connector and the CD-ROM audio connector on the system board. See “Identifying parts on the system board” on page 20.
  - c. Connect one end of the signal cable to the secondary IDE connector on the system board and the other to the CD drive or DVD drive.
  - d. Your computer has extra power connectors for connecting additional drives. Connect the power cable to the drive.



8. If you have a CD-ROM drive audio cable, connect it to the drive and the system board.
9. Slide the drive cage in and engage the latch.
10. If the drive you installed is a removable-media drive, remove the bay panel from the front bezel.

**What to do next:**

- To work with another option, go to the appropriate section.
- To complete the installation, go to “Replacing the cover and connecting the cables” on page 26.

---

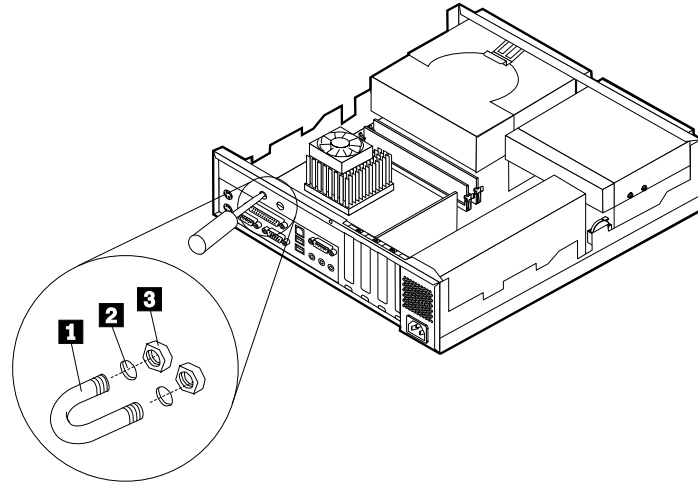
## Installing a Rope Clip

To help prevent hardware theft, you can add a 3/16 inch or 5 mm Rope Clip and cable to your computer. After you add the security cable, make sure that it does not interfere with other cables that are connected to the computer.

To install a Rope Clip:

1. Remove the cover (see “Removing the cover” on page 19).
2. Use a tool, such as a screwdriver, to remove the two metal knockouts.
3. Insert the Rope Clip through the rear panel; then attach and tighten the nuts with an appropriately sized or adjustable wrench.
4. Replace the computer cover. For more information, see “Replacing the cover and connecting the cables” on page 26.

5. Thread the cable through the Rope Clip and around an object that is not a part of or permanently secured to the building structure or foundation, and from which it cannot be removed; then fasten the cable ends together with a lock.



- 1** Rope Clip
- 2** Bolt holes
- 3** Nuts

**What to do next:**

To work with another option, go to the appropriate section.

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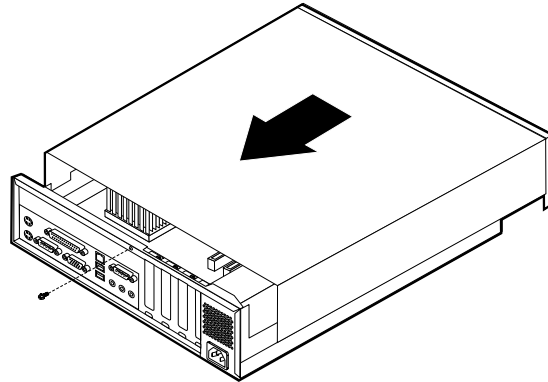
## Replacing the cover and connecting the cables

After working with options, you need to install any removed parts, replace the cover, and reconnect cables, including power cords and telephone lines. Also, depending on the option that is installed, you might need to confirm the updated information in the Configuration/Setup Utility program.

To replace the cover and connect cables to your computer:

1. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside your computer.
2. Clear any cables that might impede the replacement of the cover.

3. Place the cover over the computer and slide it to the rear until it is fully closed. Secure the cover with the screw.



4. Reconnect the external cables and cords to the computer. See “Chapter 2. Installing external options” on page 11.
5. To update the configuration, see “Chapter 6. Updating the computer configuration” on page 55.



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## Chapter 4. Installing internal options — desktop model

You can expand the capabilities of your computer by adding memory, drives, or adapters. When installing an option, use these instructions along with the instructions that come with the option.

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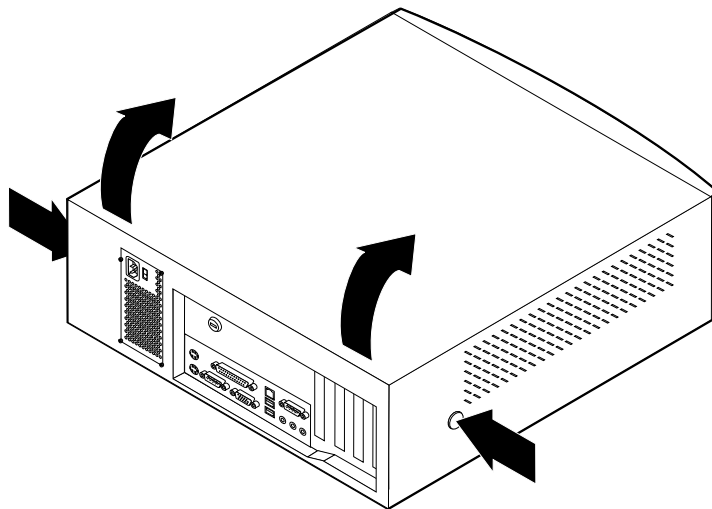
### Removing the cover

**Important:**

Read “Safety Information” on page v and “Handling static-sensitive devices” on page 8 before removing the cover.

To remove the cover:

1. Shut down your operating system, remove any media (diskettes, CDs, or tapes) from the drives, and turn off all attached devices and the computer.
2. Unplug all power cords from electrical outlets.
3. Disconnect all cables attached to the computer. This includes power cords, input/output (I/O) cables, and any other cables that are connected to the computer.
4. Press the buttons on the sides of the computer and pivot the rear end of the cover up toward the front of the computer.

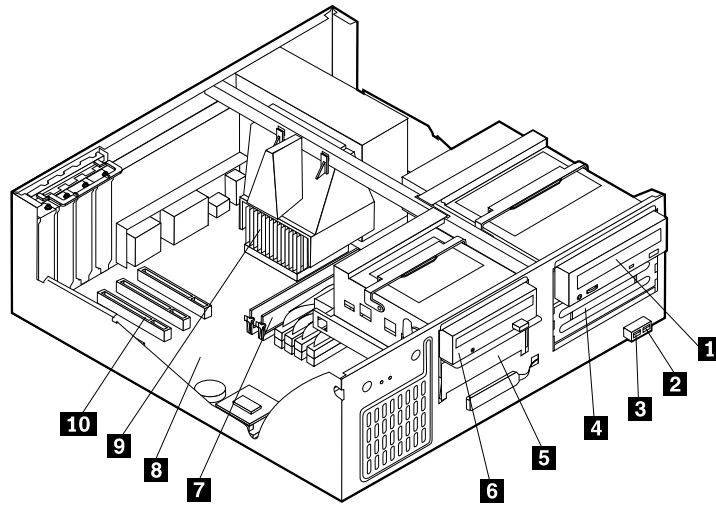




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## Locating components

The following illustration will help you locate the various components in your computer.



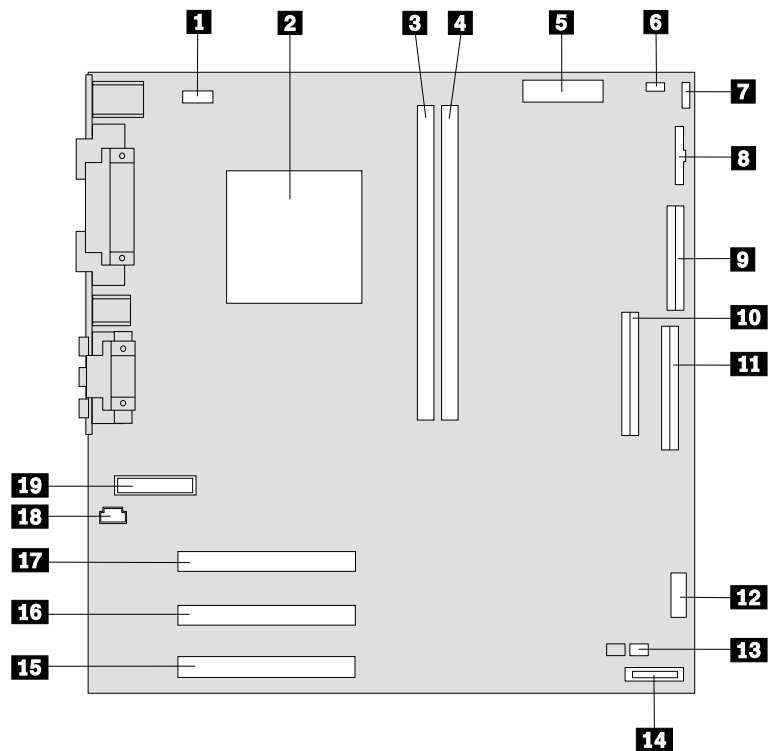
- |                              |                                       |
|------------------------------|---------------------------------------|
| <b>1</b> CD-ROM drive        | <b>6</b> Diskette drive               |
| <b>2</b> Front USB connector | <b>7</b> DIMM                         |
| <b>3</b> Front USB connector | <b>8</b> System board                 |
| <b>4</b> Optional drive bay  | <b>9</b> Microprocessor and heat sink |
| <b>5</b> Hard disk drive     | <b>10</b> PCI slot                    |

---

## Identifying parts on the system board

The system board, also called the *planar* or *motherboard*, is the main circuit board in your computer. It provides basic computer functions and supports a variety of devices that are IBM-installed or that you can install later.

See the following illustration for the location of parts on the system board.



- |                                   |   |
|-----------------------------------|---|
| <b>1</b> Fan connector            | <b>11</b> Primary IDE connector           |
| <b>2</b> Microprocessor           | <b>12</b> Front USB connector             |
| <b>3</b> DIMM 1                   | <b>13</b> Clear CMOS/BIOS recovery jumper |
| <b>4</b> DIMM 2                   | <b>14</b> Battery                         |
| <b>5</b> Power connector          | <b>15</b> PCI slot                        |
| <b>6</b> Power connector          | <b>16</b> PCI slot                        |
| <b>7</b> Hard disk LED connector  | <b>17</b> PCI slot                        |
| <b>8</b> Power LED connector      | <b>18</b> CD-ROM audio connector          |
| <b>9</b> Diskette connector       | <b>19</b> Front panel connector           |
| <b>10</b> Secondary IDE connector |   |

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## Installing memory

Your computer has two connectors for installing dual in-line memory modules (DIMMs) that provide up to a maximum of 512 MB of system memory.

### Installing DIMMs

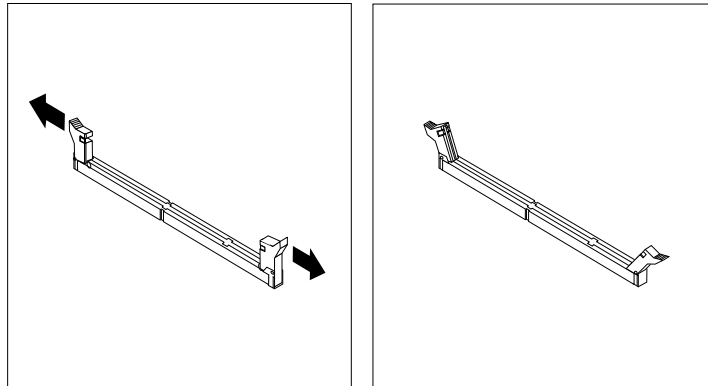
When installing DIMMs, the following rules apply:

- Fill each system memory connector sequentially, starting at DIMM 1
- Use 3.3 V, synchronous, 168-pin, unbuffered, 133 MHz nonparity synchronous dynamic random access memory (SDRAM)
- Use 32 MB, 64 MB, 128 MB, or 256 MB DIMMs in any combination
- DIMM heights of 38.1 mm (1.5 inches)

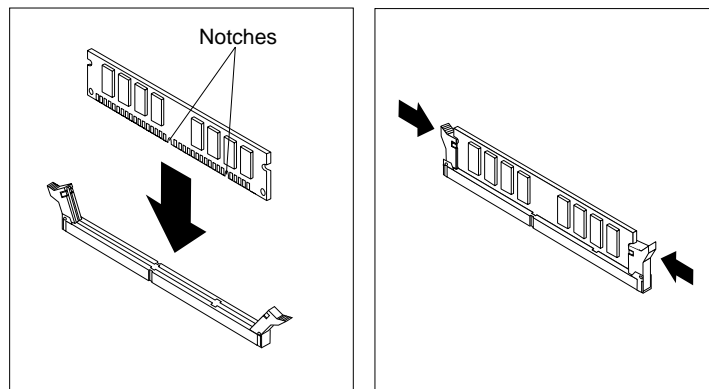
To install a DIMM:

1. Remove the cover. See “Removing the cover” on page 29.

2. To locate the DIMM connectors. See “Identifying parts on the system board” on page 30 .
3. Open the retaining clips.



4. Make sure the notches in the DIMM align with the tabs on the connector. Push or insert the DIMM straight down into the connector until the retaining clips close.



**What to do next:**

- To work with another option, go to the appropriate section.
- To complete the installation, go to “Replacing the cover and connecting the cables” on page 38.

---

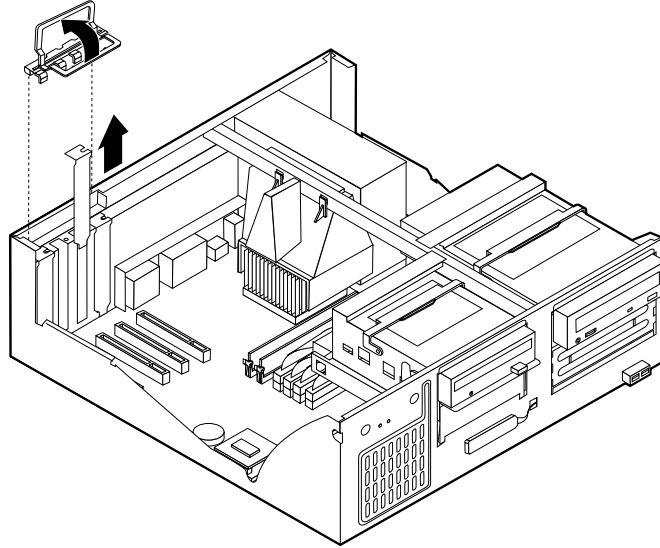
## Installing adapters

This section provides information and instructions for installing and removing adapters. Your computer has three expansion slots for peripheral component interconnect (PCI) adapters. You can install an adapter up to 330 mm (13 inches) long.

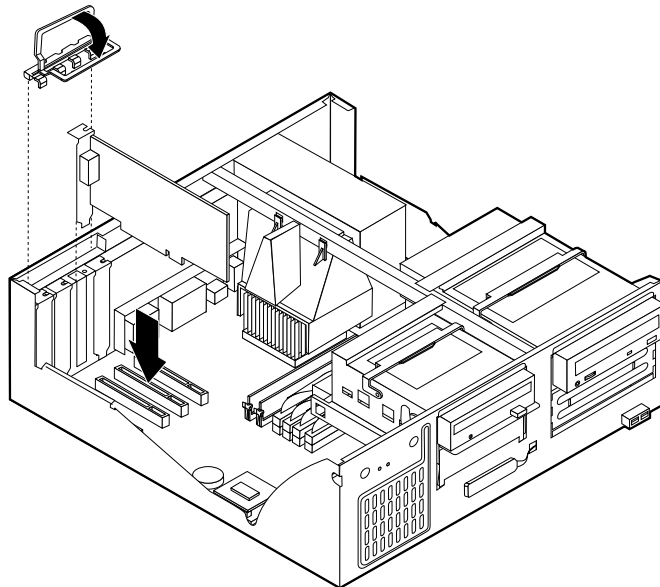
To install an adapter:

1. Remove the cover. See “Removing the cover” on page 29.

2. Remove the adapter slot cover latch and the slot cover for the appropriate expansion slot.



3. Remove the adapter from its static-protective package.
4. Install the adapter into the appropriate slot on the system board.
5. Install the adapter slot cover latch.



**What to do next:**

- To work with another option, go to the appropriate section.
- To complete the installation, go to “Replacing the cover and connecting the cables” on page 38.

---

## Installing internal drives

This section provides information and instructions for installing and removing internal drives.

Internal drives are devices that your computer uses to read and store data. You can add drives to your computer to increase storage capacity and to enable your computer to read other types of media. Some of the different drives that are available for your computer are:

- Hard disk drives
- Tape drives
- CD drives or DVD drives
- Removable media drives

Internal drives are installed in *bays*. Within this book, the bays are referred to as bay 1, bay 2, and so on.

When you install an internal drive, it is important to note what type and size of drive that you can install in each bay. Also, it is important to correctly connect the internal drive cables to the installed drive.

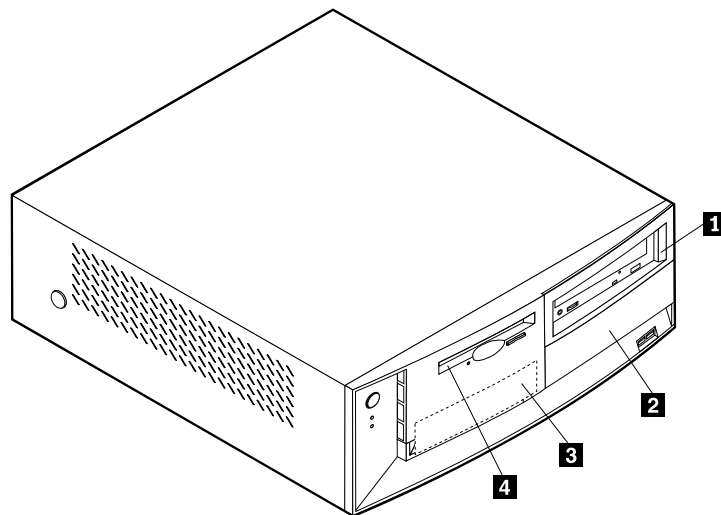
## Drive specifications

Your computer comes with the following IBM-installed drives:

- A CD-ROM drive in bay 1 (some models)
- A 3.5-inch hard disk drive in bay 3
- A 3.5-inch diskette drive in bay 4

Models that do not have drives installed in bays 1 and 2 have a static shield and bay panel installed.

The following illustration shows the locations of the drive bays.



The following table describes some of the drives that you can install in each bay and their height requirements.

<b>1</b>	Bay 1 - Max Height: 41.3 mm (1.6 in.)	CD-ROM drive (standard in some models) 5.25-inch hard disk drive
<b>2</b>	Bay 2 - Max Height: 41.3 mm (1.6 in.)	5.25-inch hard disk drive 3.5-inch hard disk drive (requires a mounting bracket) CD-ROM drive DVD-ROM drive
<b>3</b>	Bay 3 - Max Height: 25.4 mm (1.0 in.)	3.5-inch hard disk drive (preinstalled)
<b>4</b>	Bay 4 - Max Height: 25.4 mm (1.0 in.)	3.5-inch diskette drive (preinstalled)

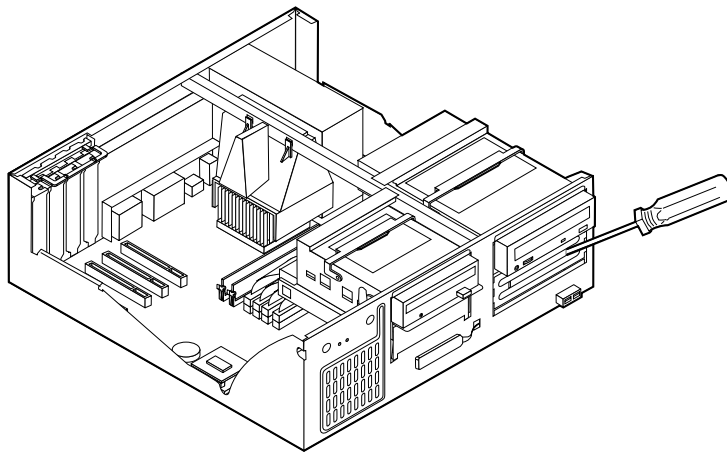
**Notes:**

1. Drives that are greater than 41.3 mm (1.6 in.) high cannot be installed.
2. Install removable media (tape or CD) drives in the accessible bay: bay 1 or 2.

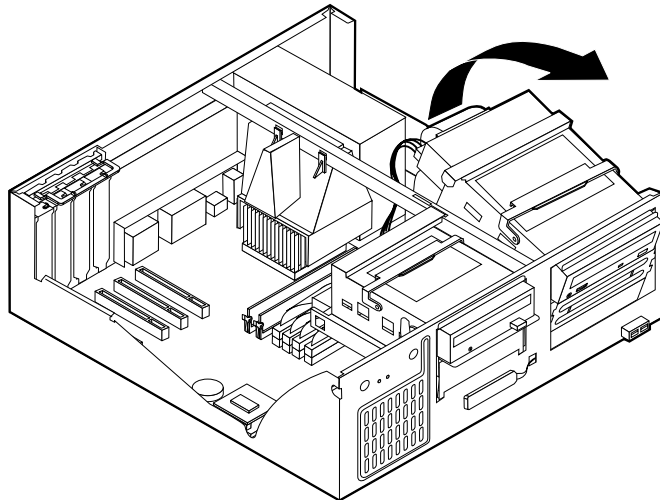
## Installing a drive

To install an internal drive, follow these steps.

1. Remove the cover. See “Removing the cover” on page 29.
2. If your computer has a CD drive or DVD drive, you might need to remove the signal and power cables from the drive.
3. If the drive you installed is a removable-media drive, remove the bay panel from the front bezel.
4. Remove the metal shield from the drive bay by inserting a flat-blade screwdriver into one of the slots and gently pry it loose.



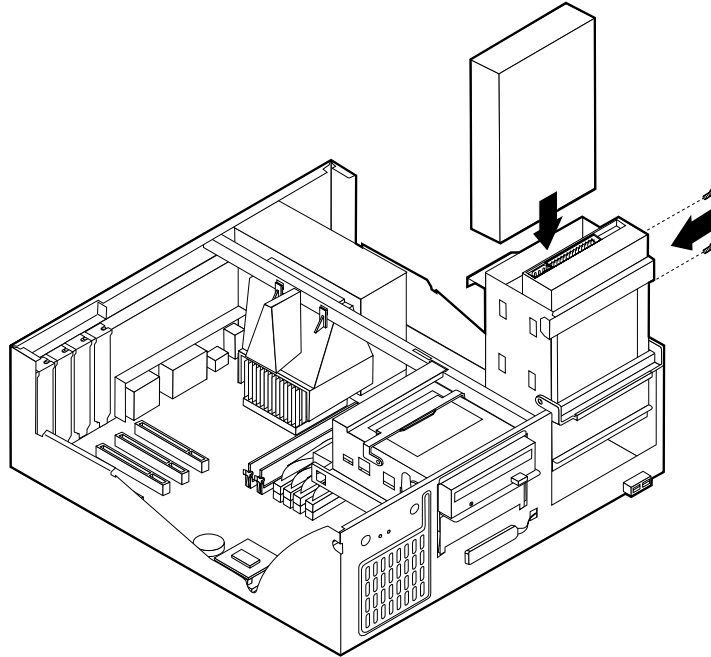
5. Pivot the drive bay latch handle toward the front of the computer and pivot the drive bay cage toward the front of the computer until the drive cage latch catches to the chassis.



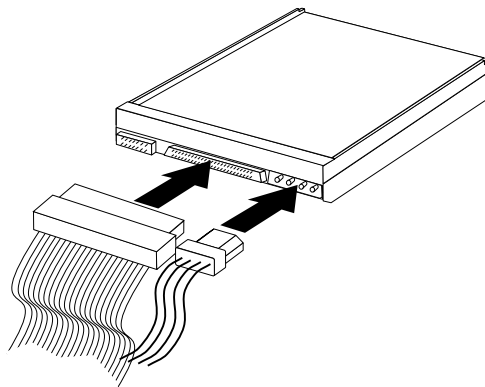
6. Make sure the drive that you are installing is set correctly as either a master or a slave device.
  - If it is the first CD drive or DVD drive, set as a master device.
  - If it is an additional CD drive or DVD drive, set as a slave device.
  - If it is a hard disk drive, set as a slave device.

Refer to the documentation that comes with your drive for master/slave jumper information.

7. Install the drive into the bay. Align the screw holes and insert the two screws.



8. Pivot the drive bay cage back into place.
9. Each integrated drive electronics (IDE) drive requires two cables; a four-wire power cable that connects to the power supply and a signal cable that connects to the system board. You might also have an audio cable to connect.



The steps to connect an IDE drive are different depending on the type of drive you are connecting. Locate the procedure below for your drive connection.

### **To connect the first IDE CD drive or DVD drive**

1. Locate the three-connector signal cable that came with your computer or with the new drive.
2. Locate the secondary IDE connector and CD-ROM audio connector on the system board. See “Identifying parts on the system board” on page 30.
3. Connect one end of the signal cable to the drive and the other to the secondary IDE connector on the system board. To reduce electronic noise, use the connectors at the end of the cable only.

4. Your computer has extra power connectors for additional drives. Connect a power connector to the drive.
5. If you have a CD-ROM drive audio cable, connect it to the drive and the system board.

### **To connect an additional IDE CD drive or DVD drive**

1. Locate the secondary IDE connector on the system board and the three-connector signal cable. See “Identifying parts on the system board” on page 30.
2. Connect the extra connector in the signal cable to the new CD drive or DVD drive.
3. Your computer has extra power connectors for additional drives. Connect a power connector to the drive.

### **To connect an additional IDE hard disk drive**

1. You will have to obtain a three-connector signal cable to connect your new hard disk.
2. Remove the two-connector cable from the hard disk drive.
3. Locate the primary IDE connector on the system board. One end of the three-connector cable connects to the hard disk drive and the other connects to the system board. See “Identifying parts on the system board” on page 30.
4. Connect the extra connector in the signal cable to the new hard disk drive.
5. Your computer has extra power connectors for additional drives. Connect a power connector to the drive.

#### **What to do next**

- To work with another option, go to the appropriate section.
- To complete the installation, go to “Replacing the cover and connecting the cables” on page 38.

---

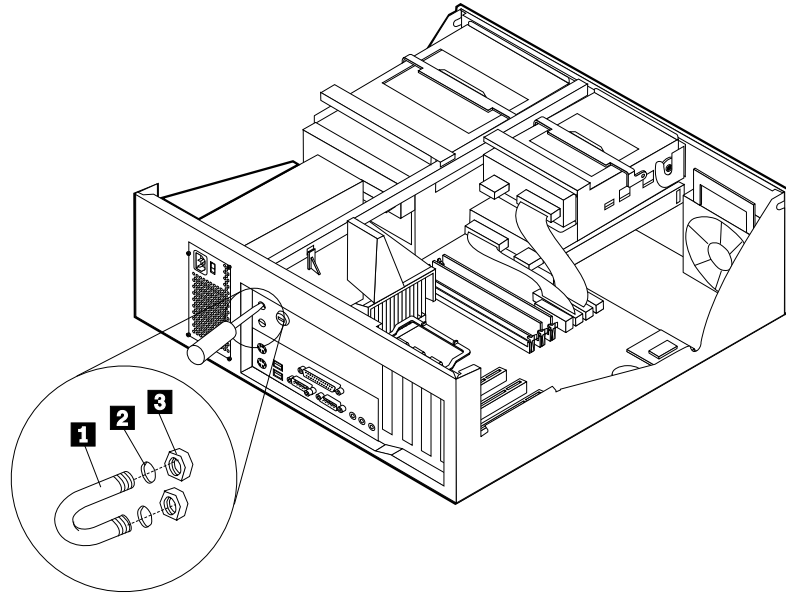
## **Installing a Rope Clip**

To help prevent hardware theft, you can add a 3/16 inch or 5 mm Rope Clip and cable to your computer. After you add the security cable, make sure that it does not interfere with other cables that are connected to the computer.

To install a Rope Clip:

1. Remove the cover. See “Removing the cover” on page 29.
2. Use a tool, such as a screwdriver, to remove the two metal knockouts.
3. Insert the Rope Clip through the rear panel; then attach and tighten the nuts with an appropriately sized or adjustable wrench.
4. Replace the computer cover. For more information, see “Replacing the cover and connecting the cables” on page 38.
5. Thread the cable through the Rope Clip and around an object that is not a part of or permanently secured to the building structure or foundation, and from which it cannot be removed; then fasten the cable ends together with a lock.





- 1** Rope Clip
- 2** Bolt holes
- 3** Nuts

**What to do next:**

To work with another option, go to the appropriate section.

---

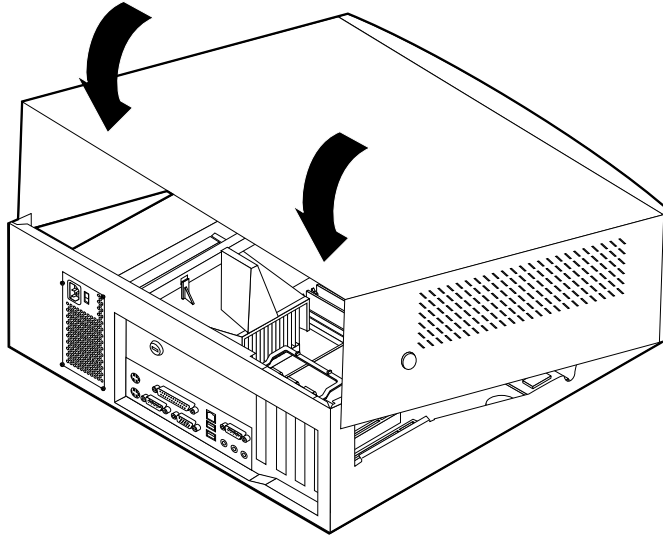
## Replacing the cover and connecting the cables

After working with options, you need to install any removed parts, replace the cover, and reconnect any cables, including power cords and telephone lines. Also, depending on the option that is installed, you might need to confirm the updated information in the Configuration/Setup Utility program.

To replace the cover and connect cables to your computer:

1. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside your computer.
2. Clear any cables that might impede the replacement of the cover.

3. Position the cover over the chassis and pivot the cover down over the computer until the cover snaps into place.



4. Reconnect the external cables and cords to the computer. See “Chapter 2. Installing external options” on page 11.
5. To update the configuration, see “Chapter 6. Updating the computer configuration” on page 55.



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## Chapter 5. Installing internal options — microtower model

You can expand the capabilities of your computer by adding memory, drives, or adapters. When installing an option, use these instructions along with the instructions that come with the option.

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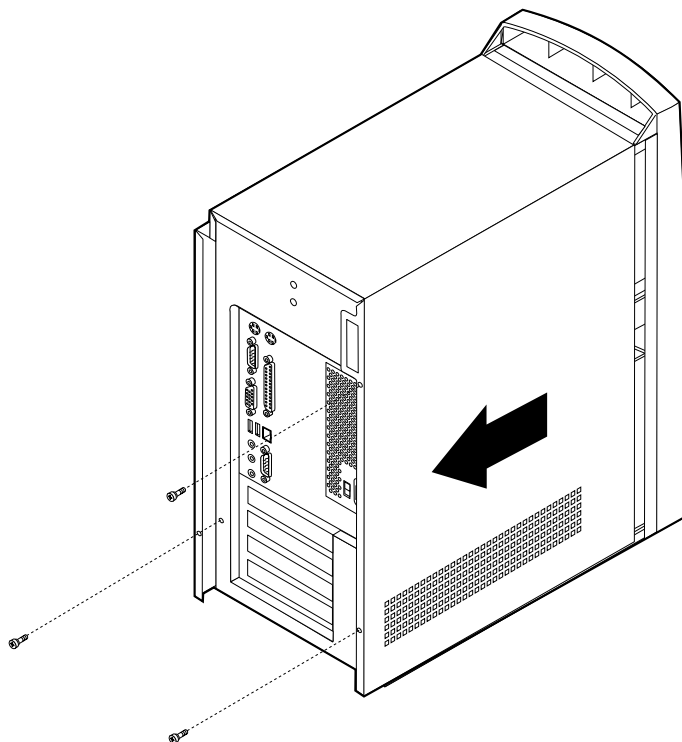
### Removing the cover

**Important:**

Read “Safety Information” on page v and “Handling static-sensitive devices” on page 8 before removing the cover.

To remove the cover:

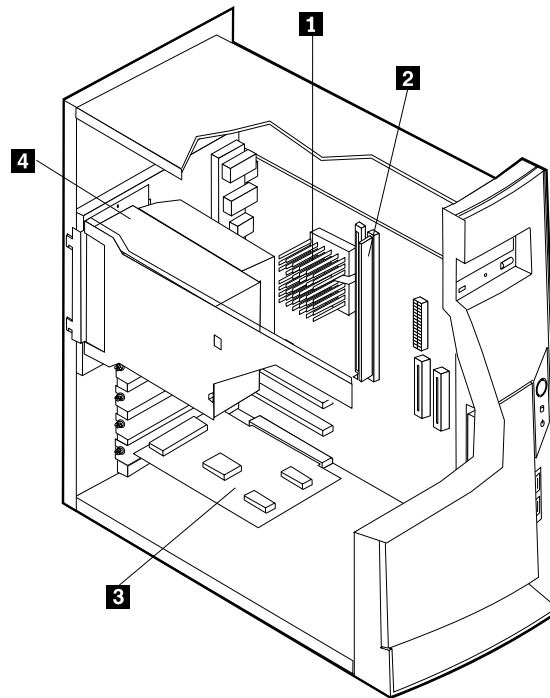
1. Shut down your operating system, remove any media (diskettes, CDs, or tapes) from the drives, and turn off all attached devices and the computer.
2. Unplug all power cords from electrical outlets.
3. Disconnect all cables attached to the computer. This includes power cords, input/output (I/O) cables, and any other cables that are connected to the computer.
4. Remove the thumbscrews from the rear of the computer and slide the cover toward the rear of the computer.



---

## Locating components

The following illustration will help you locate the various components in your computer.



**1** Microprocessor and heat sink  
**2** DIMM

**3** PCI adapter  
**4** Power supply

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## Moving the power supply

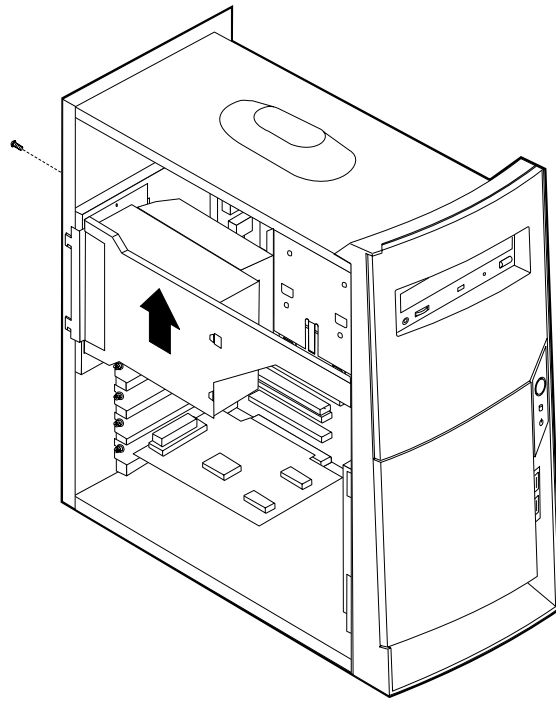
To perform some operations inside the computer, you might need to move the power supply to access parts of the system board that are difficult to see or hard to reach. Use the following procedure to provide easier access to the system board.

### **DANGER**

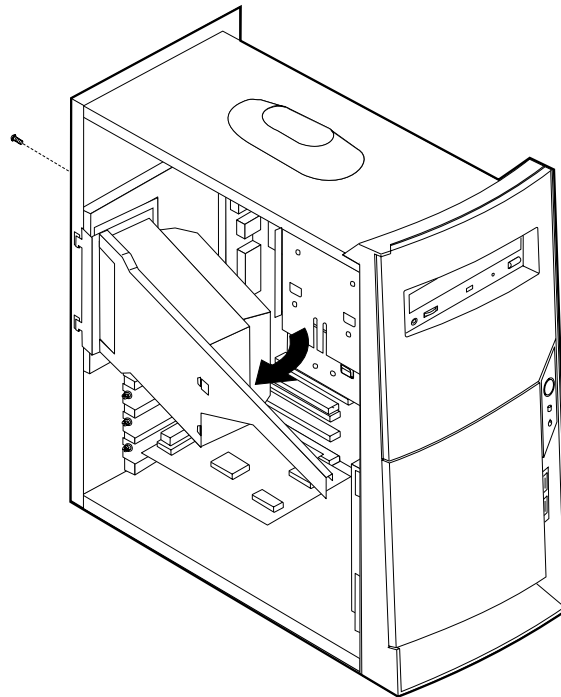
**Do not detach the power supply bracket from the power supply or remove any of the power supply screws.**

1. Remove the thumbscrew securing the power supply to the rear of the chassis.

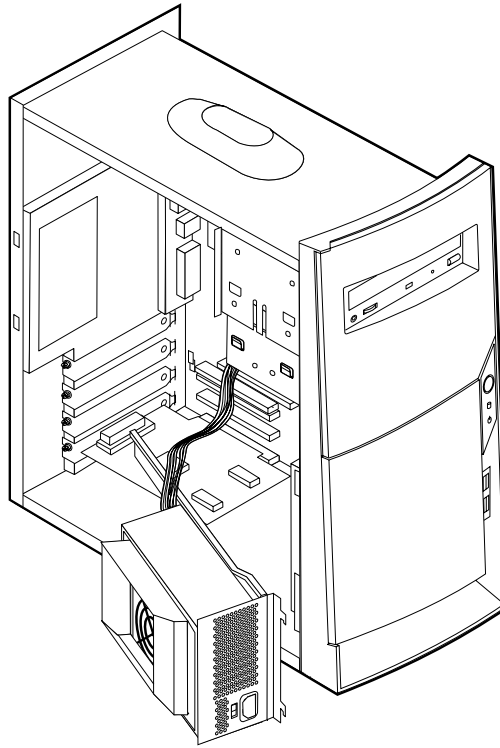
2. Push the metal tab and slide the power supply unit inward.



3. Rotate the power supply outward as shown.



4. Remove the power supply and carefully lay it to the side.



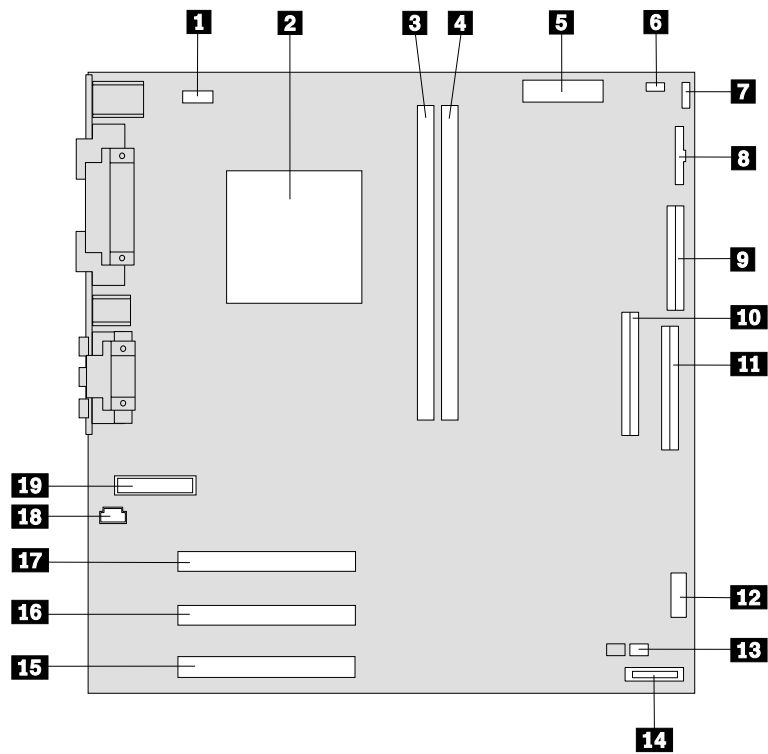
5. To replace the power supply, reverse these steps.

---

## Identifying parts on the system board

The system board, also called the *planar* or *motherboard*, is the main circuit board in your computer. It provides basic computer functions and supports a variety of devices that are IBM-installed or that you can install later.

See the following illustration for the location of parts on the system board.



- |                                   |   |
|-----------------------------------|---|
| <b>1</b> Fan connector            | <b>11</b> Primary IDE connector           |
| <b>2</b> Microprocessor           | <b>12</b> Front USB connector             |
| <b>3</b> DIMM 1                   | <b>13</b> Clear CMOS/BIOS recovery jumper |
| <b>4</b> DIMM 2                   | <b>14</b> Battery                         |
| <b>5</b> Power connector          | <b>15</b> PCI slot                        |
| <b>6</b> Power connector          | <b>16</b> PCI slot                        |
| <b>7</b> Hard disk LED connector  | <b>17</b> PCI slot                        |
| <b>8</b> Power LED connector      | <b>18</b> CD-ROM audio connector          |
| <b>9</b> Diskette connector       | <b>19</b> Front panel connector           |
| <b>10</b> Secondary IDE connector |   |

---

## Installing memory

Your computer has two connectors for installing dual in-line memory modules (DIMMs) that provide up to a maximum of 512 MB of system memory.

### Installing DIMMs

When installing DIMMs, the following rules apply:

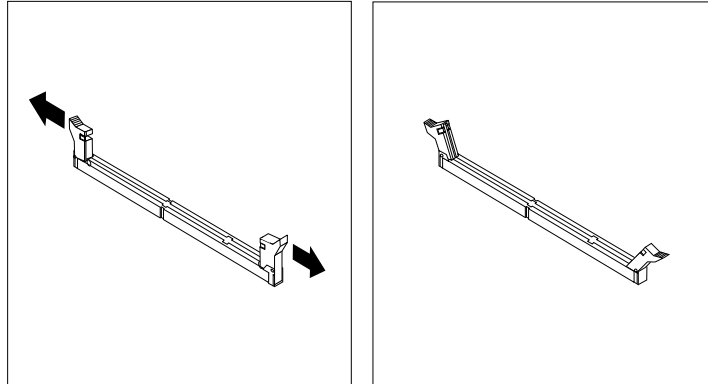
- Fill each system memory connector sequentially, starting at DIMM 1
- Use 3.3 V, synchronous, 168-pin, unbuffered, 133 MHz nonparity synchronous dynamic random access memory (SDRAM)
- Use 32 MB, 64 MB, 128 MB, or 256 MB DIMMs in any combination
- DIMM heights of 38.1 mm (1.5 inches)

To install a DIMM:

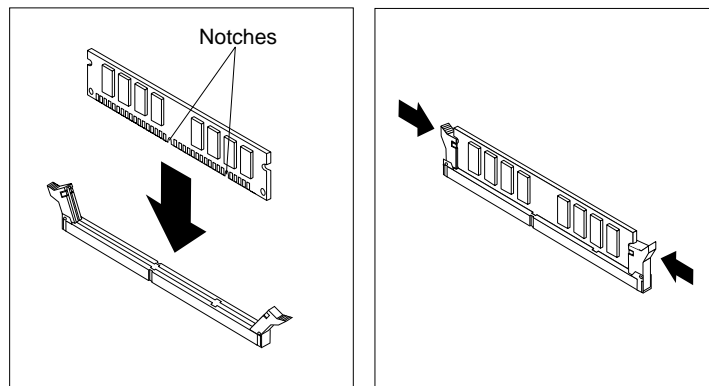
1. Remove the cover. See “Removing the cover” on page 41.



2. You might have to remove an adapter to gain access to the DIMM slots. See “Installing adapters”.
3. To locate the DIMM connectors. See “Identifying parts on the system board” on page 44.
4. Open the retaining clips.



5. Make sure the notches in the DIMM align with the tabs on the connector. Push or insert the DIMM straight down into the connector until the retaining clips close.



**What to do next:**

- Replace any adapters that were removed.
- Replace the power supply.
- To work with another option, go to the appropriate section.
- To complete the installation, go to “Replacing the cover and connecting the cables” on page 52.

---

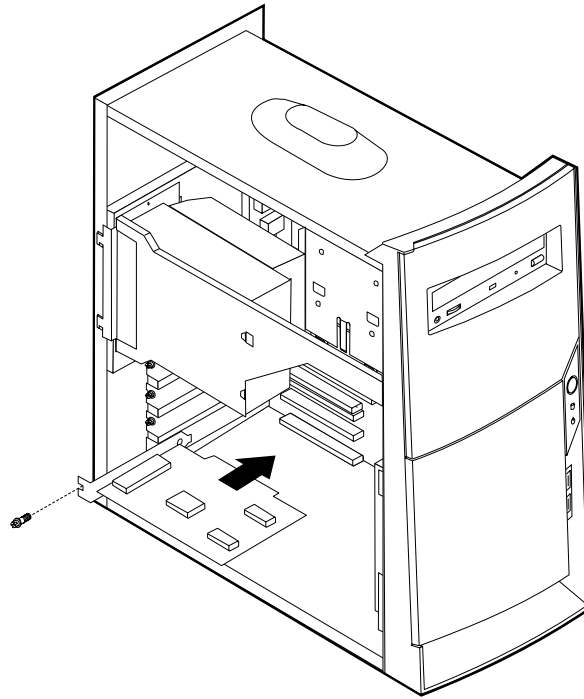
## Installing adapters

This section provides information and instructions for installing and removing adapters. Your computer has three expansion slots for peripheral component interconnect (PCI) adapters. You can install an adapter up to 330 mm (13 inches) long.

To install an adapter:

1. Remove the cover. See “Removing the cover” on page 41.

2. Remove the adapter slot cover for the appropriate expansion slot.



3. Remove the adapter from its static-protective package.
4. Install the adapter into the appropriate slot on the system board.
5. Install the screws that secure the adapter.

#### What to do next

- To work with another option, go to the appropriate section.
- To complete the installation, go to “Replacing the cover and connecting the cables” on page 52.

---

## Installing internal drives

This section provides information and instructions for installing and removing internal drives.

Internal drives are devices that your computer uses to read and store data. You can add drives to your computer to increase storage capacity and to enable your computer to read other types of media. Some of the different drives that are available for your computer are:

- Hard disk drives
- Tape drives
- CD drives or DVD drives
- Removable media drives

Internal drives are installed in *bays*. Within this book, the bays are referred to as bay 1, bay 2, and so on.

When you install an internal drive, it is important to note what type and size of drive that you can install in each bay. Also, it is important to correctly connect the internal drive cables to the installed drive.

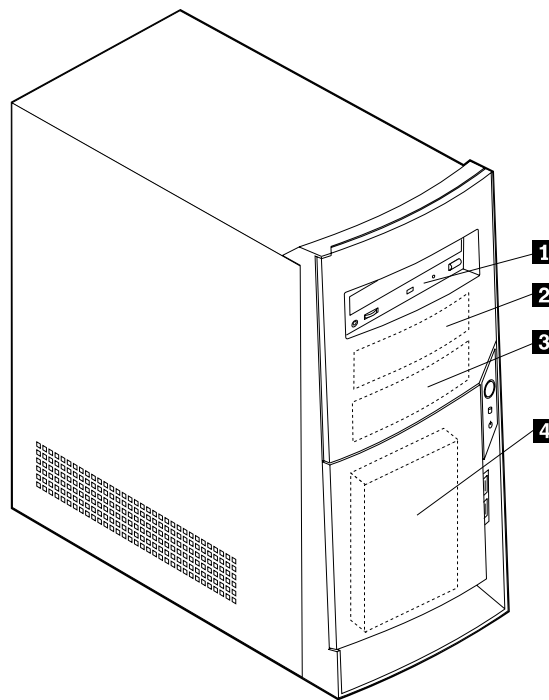
## Drive specifications

Your computer comes with the following IBM-installed drives:

- A CD drive or DVD drive in bay 1 (some models)
- A 3.5-inch diskette disk drive in bay 3
- A 3.5-inch hard drive in bay 4

Models that do not have drives installed in bays 1 and 2 have a static shield and bay panel installed.

The following illustration shows the locations of the drive bays.



The following table describes some of the drives you can install in each bay and their height requirements.

<b>1</b> Bay 1 - Maximum Height: 41.3 mm (1.6 in.)	CD-ROM drive (standard in some models) 5.25-inch hard disk drive
<b>2</b> Bay 2 - Maximum Height: 41.3 mm (1.6 in.)	5.25-inch hard disk drive 3.5-inch hard disk drive (requires a mounting bracket) CD-ROM drive DVD-ROM drive
<b>3</b> Bay 3 - Maximum Height: 25.4 mm (1.0 in.)	3.5-inch diskette drive (preinstalled)
<b>4</b> Bay 4 - Maximum Height: 25.4 mm (1.0 in.)	Hard disk drive (preinstalled)

### Notes:

1. Drives that are greater than 41.3 mm (1.6 in.) high cannot be installed.
2. Install removable media (tape or CD) drives in the accessible bays: bay 1 or 2.

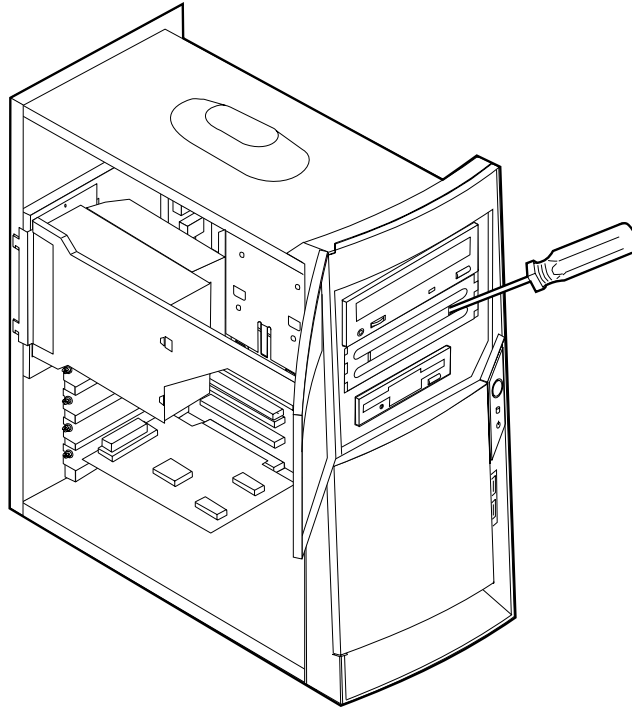
## Installing a drive

To install an internal drive, follow these steps.

1. Remove the cover. See “Removing the cover” on page 41.

**Note:** If your computer has a CD drive or DVD drive, you might need to remove the signal and power cables from the drive.

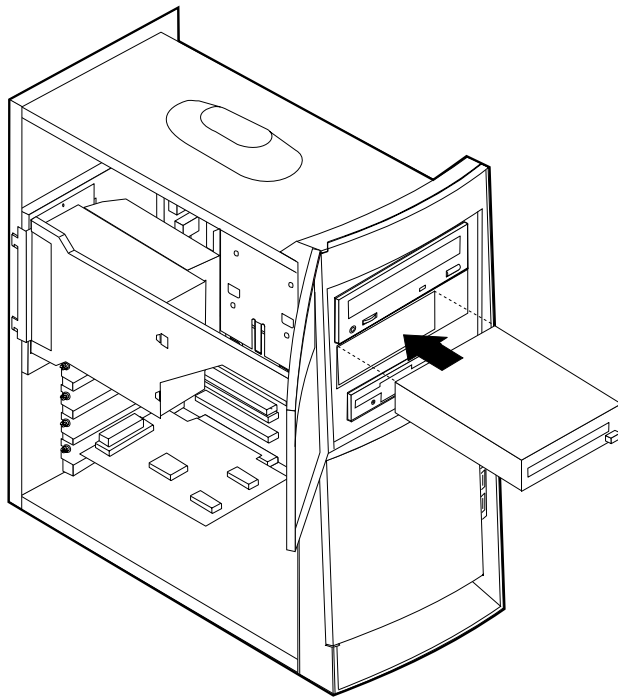
2. Remove the bay panel from the drive bay by inserting a flat-blade screwdriver at the end and gently prying it loose.
3. Remove the metal shield from the drive bay by inserting a flat-blade screwdriver into one of the slots and gently prying it loose.



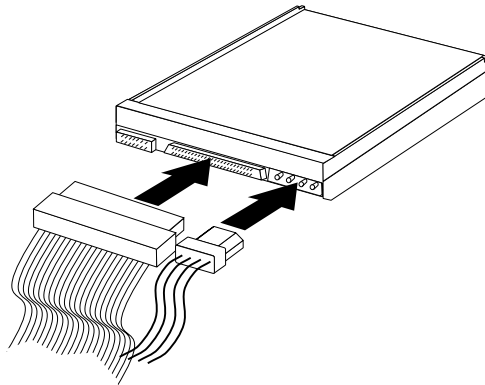
4. Make sure the drive that you are installing is set correctly as either a master or a slave device.
  - If it is the first CD drive or DVD drive, set as a master device.
  - If it is an additional CD drive or DVD drive, set as a slave device.
  - If it is a hard disk drive, set as a slave device.

Refer to the documentation that comes with your drive for master/slave jumper information.

5. Install the drive into the bay. Align the screw holes, and insert the two screws.



6. Each integrated drive electronics (IDE) drive requires two cables; a four-wire power cable that connects to the power supply and a signal cable that connects to the system board. You might also have an audio cable to connect.



The steps to connect an IDE drive are different depending on the type of drive you are connecting. Locate the procedure below for your drive connection.

### **To connect the first IDE CD drive or DVD drive**

1. Locate the three-connector signal cable that came with your computer or with the new drive.
2. Locate the secondary IDE connector on the system board. See “Identifying parts on the system board” on page 44.
3. Connect one end of the signal cable to the drive and the other to the secondary IDE connector on the system board. To reduce electronic noise, use the connectors at the end of the cable only.
4. Your computer has extra power connectors for additional drives. Connect a power connector to the drive.

5. If you have a CD-ROM drive audio cable, connect it to the drive and the system board.

### **To connect an additional IDE CD drive or DVD drive**

1. Locate the secondary IDE connector on the system board and the three-connector signal cable. See “Identifying parts on the system board” on page 44.
2. Connect the extra connector in the signal cable to the new CD drive or DVD drive.
3. Your computer has extra power connectors for additional drives. Connect a power connector to the drive.

### **To connect an additional IDE hard disk drive**

1. You will have to obtain a three-connector signal cable to connect your new hard disk.
2. Remove the two-connector cable from the hard disk drive.
3. Locate the primary IDE connector on the system board. One end of the three-connector cable connects to the hard disk drive and the other connects to the system board. See “Identifying parts on the system board” on page 44.
4. Connect the extra connector in the signal cable to the new hard disk drive.
5. Your computer has extra power connectors for additional drives. Connect a power connector to the drive.

#### **What to do next**

- To work with another option, go to the appropriate section.
- To complete the installation, go to “Replacing the cover and connecting the cables” on page 52.

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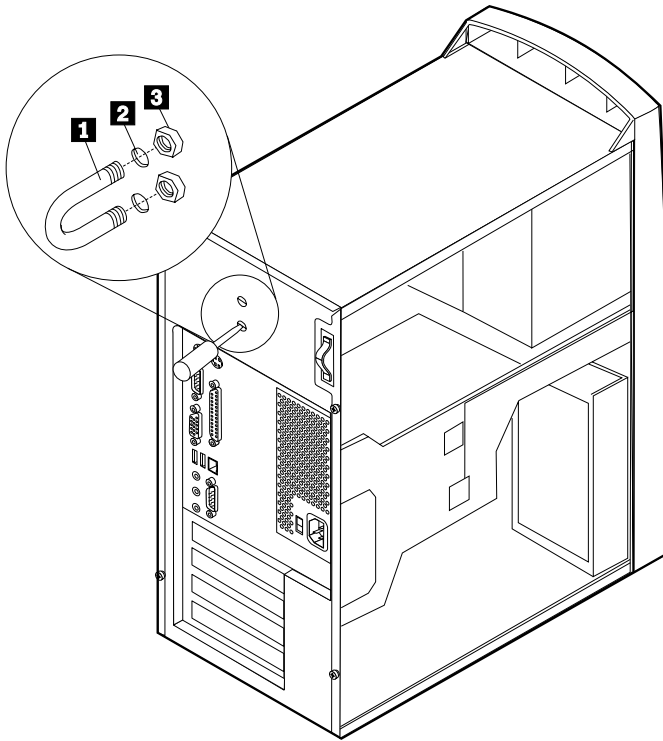
## **Installing a Rope Clip**

To help prevent hardware theft, you can add a 3/16 inch or 5 mm Rope Clip and cable to your computer. After you add the security cable, make sure that it does not interfere with other cables that are connected to the computer.

To install a Rope Clip:

1. Remove cover (see “Removing the cover” on page 41).
2. Use a tool, such as a screwdriver, to remove the two metal knockouts.
3. Insert the Rope Clip through the rear panel; then attach and tighten the nuts with an appropriately sized or adjustable wrench.
4. Replace the computer cover. For more information, see “Replacing the cover and connecting the cables” on page 52.
5. Thread the cable through the Rope Clip and around an object that is not a part of or permanently secured to the building structure or foundation, and from

which it cannot be removed; then fasten the cable ends together with a lock.



- 1** Rope Clip
- 2** Bolt holes
- 3** Nuts

**What to do next:**

To work with another option, go to the appropriate section.

---

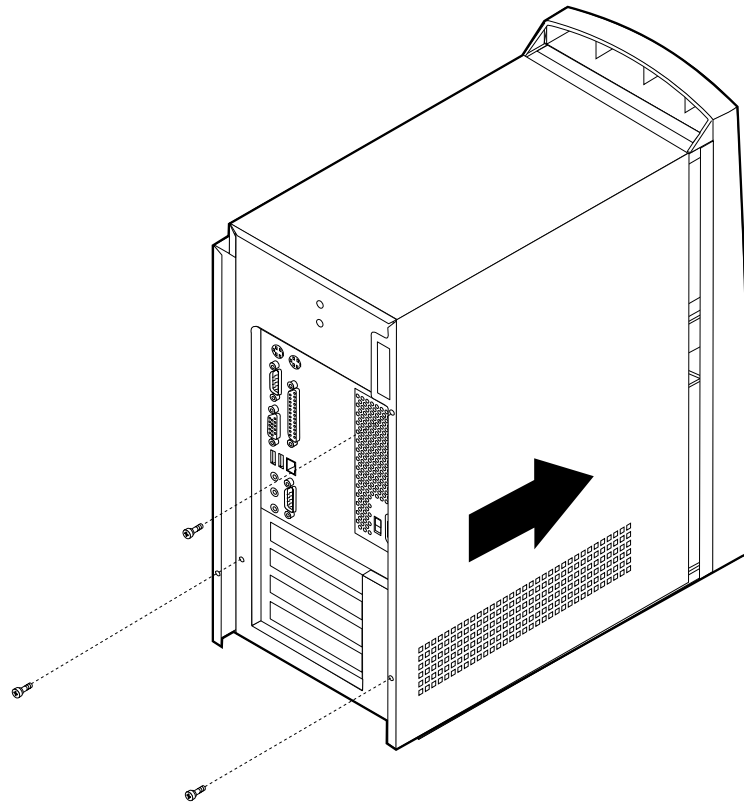
## Replacing the cover and connecting the cables

After working with options, you need to install any removed parts, replace the cover, and reconnect any cables, including power cords and telephone lines. Also, depending on the option that is installed, you might need to confirm the updated information in the Configuration/Setup Utility program.

To replace the cover and connect cables to your computer:

1. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside your computer.
2. Clear any cables that might impede the replacement of the cover.

3. Position the cover over the chassis so that the front edge is approximately one inch away from the front bezel.



4. Lower the cover down over the chassis so that the rail guides engage the rails.
5. Slide the cover forward. You might need to lift the front of the cover slightly to align it properly.
6. Insert the three thumbscrews into the holes in the cover and the chassis and tighten.
7. Reconnect the external cables and cords to the computer. See “Chapter 2. Installing external options” on page 11
8. To update the configuration, see “Chapter 6. Updating the computer configuration” on page 55.

**Important:**

When the power cord is first plugged in, the computer might appear to power on for a few seconds, then power off. This is a normal sequence to enable the computer to initialize.





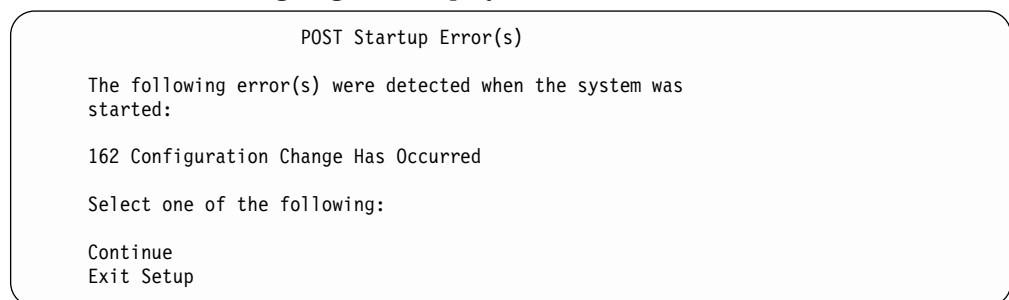
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## Chapter 6. Updating the computer configuration

This chapter includes information about updating configuration settings, installing device drivers (if required, after a new option has been installed), and erasing a lost or forgotten password. For more information about using the Configuration/Setup Utility program, see Access IBM on your desktop.

After you add options, the configuration settings must be updated. In most cases, this configuration update is performed automatically.

In some cases, when you start your computer after installing an option, a message similar to the following might be displayed.



If this message is displayed, select **Continue** and press Enter. The Configuration/Setup Utility program automatically starts. From the Configuration/Setup Utility program menu, do the following:

1. Select **Exit** and press Enter.
2. Select **Exit Saving Changes** and press Enter.

The computer will restart.

The Windows operating system will usually detect the new option, update the configuration information, and prompt you for device drivers, if required. Before installing any device drivers, always check the documentation that is provided with your option for specific instructions. Not all device drivers are installed in the same way. Some options might also require you to install other software.

---

### Verifying that an option is installed correctly

To verify if a new adapter or drive is correctly installed and configured, do the following:

1. From the Windows desktop, use the right mouse button to click **My Computer**; then, click **Properties**.
2. In the System Properties window, click the **Device Manager** tab.

**Note:** If you are running Windows 2000, in the System Properties window, click the **Hardware** tab first; then click the **Device Manager** tab.

3. Click **View devices by type**.
4. Click the plus sign next to each of the device types to expand the list.
  - If neither an X nor a circled exclamation point appears over any of the icons, all devices are working properly.

- An X over an icon indicates that the device is disabled. A circled exclamation point over an icon indicates a resource conflict. If an X or a circled exclamation point appears over an icon, click **Properties** to learn more about the source of the problem.
- If the device is not listed, it might not be installed correctly. Make sure that the option is installed according to instructions, all cables and connections are secure, and any jumper or switch settings are correct.
- If the device is listed under “Other devices,” a required device driver is either missing or installed incorrectly, or the operating system was not restarted after the device driver was installed. Restart the computer and check the device again. If it is still listed under “Other devices,” refer to the documentation that comes with the option, and reinstall the device driver.

**Note:** For further information, refer to the manual for the operating system.

---

## Configuring PCI adapters

Along with the documentation that comes with your adapter, use the following information to help with adapter configuration.

PCI adapters generally require no user configuration. The computer and operating system work together to automatically manage the resources that are required by each device that is installed in the computer and to assign resources to new devices in a manner that avoids system conflicts.

---

## Configuring startup devices

When your computer is turned on, it searches for an operating system. The order in which it searches devices for the operating system is the *startup sequence*. After adding new devices to the computer, you might want to change the startup sequence. You can use the Configuration/Setup Utility program to configure startup devices. For more information, see Access IBM on your desktop.

---

## Erasing a lost or forgotten password (clearing CMOS)

This section applies to lost or forgotten passwords. For more information about lost or forgotten passwords, see Access IBM on your desktop.

To erase a forgotten password:

1. Turn off the computer and all attached devices.
2. Unplug the power cord.
3. Remove the cover. See “Removing the cover” on page 19 (small desktop model), “Removing the cover” on page 29 (desktop model), or “Removing the cover” on page 41 (microtower model).
4. Locate the Clear CMOS/BIOS Recovery jumper on the system board. See “Identifying parts on the system board” on page 20 (small desktop model), “Identifying parts on the system board” on page 30 (desktop model), or “Identifying parts on the system board” on page 44 (microtower model).
5. Move the jumper from the standard position (pins 1 and 2) to the maintenance or configure position (pins 2 and 3).
6. Replace the cover and connect the power cord. See “Replacing the cover and connecting the cables” on page 26 (small desktop model), “Replacing the cover

and connecting the cables” on page 38 (desktop model), or “Replacing the cover and connecting the cables” on page 52 (microtower model).

7. Restart the computer, leave it on for about ten seconds, and then turn off the computer. You will hear beeps.
8. Repeat steps 2 through 4 on page 55.
9. Move the jumper back to the standard (pins 1 and 2).
10. Replace the cover and connect the power cord. See “Replacing the cover and connecting the cables” on page 26 (small desktop model), “Replacing the cover and connecting the cables” on page 38 (desktop model), or “Replacing the cover and connecting the cables” on page 52 (microtower model).



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## Appendix A. Changing the battery

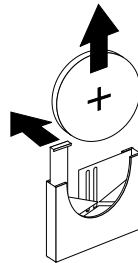
Your computer has a special type of memory that maintains the date, time, and settings for built-in features, such as parallel-port assignments (configuration). A battery keeps this information active when you turn off the computer.

The battery normally requires no charging or maintenance throughout its life; however, no battery lasts forever. If the battery fails, the date, time, and configuration information (including passwords) are lost. An error message is displayed when you turn on the computer.

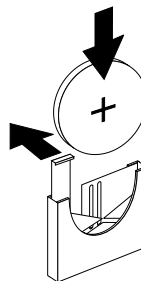
Refer to “Lithium battery notice” on page vi for information about replacing and disposing of the battery.

To change the battery:

1. Turn off the computer and all attached devices.
2. Unplug the power cord and remove the cover. See “Removing the cover” on page 19 (small desktop model), “Removing the cover” on page 29 (desktop model), or “Removing the cover” on page 41 (microtower model).
3. Locate the battery. See “Identifying parts on the system board” on page 20 (small desktop model), “Identifying parts on the system board” on page 30 (desktop model), or “Identifying parts on the system board” on page 44 (microtower).
4. If necessary, remove any adapters that impede access to the battery. See “Installing adapters” on page 22 (small desktop model), “Installing adapters” on page 32 (desktop model), or “Installing adapters” on page 46 (microtower model) for more information.
5. Remove the old battery.



6. Install the new battery.



7. Replace any adapters that were removed to gain access to the battery. See “Installing adapters” on page 22 (small desktop model),

“Installing adapters” on page 32 (desktop model), or  
“Installing adapters” on page 46 (microtower model) for instructions for  
replacing adapters.

8. Replace the cover, and plug in the power cord. See “Replacing the cover and connecting the cables” on page 26 (small desktop model), “Replacing the cover and connecting the cables” on page 38 (desktop model), or “Replacing the cover and connecting the cables” on page 52 (microtower model).

**Note:** When the computer is turned on for the first time after battery replacement, an error message might be displayed. This is normal after replacing the battery.

9. Turn on the computer and all attached devices.
10. Use the Configuration/Setup Utility program to set the date and time and any passwords.

---

## Appendix B. Updating System Programs

The following contains information about updating system programs (POST/BIOS) and how to recover from a POST/BIOS update failure.

---

### System programs

*System programs* are the basic layer of software that is built into your computer. They include the power-on self-test (POST), the basic input/output system (BIOS) code, and the Configuration/Setup Utility program. POST is a set of tests and procedures that is performed each time you turn on your computer. BIOS is a layer of software that translates instructions from other layers of software into electrical signals that the computer hardware can understand. You can use the Configuration/Setup Utility program to view and change the configuration and setup of your computer.

Your computer system board has a module called *electrically erasable programmable read-only memory* (EEPROM, also referred to as *flash memory*). You can easily update POST, BIOS, and the Configuration/Setup Utility program by starting your computer using a flash update diskette.

IBM might make changes and enhancements to the system programs. When updates are released, they are available as downloadable files on the World Wide Web (see *the Quick Reference*). Instructions for using the system program updates are available in a README file that is included in the update files.

To update system programs (flash the EEPROM):

1. Insert a system program update (flash) diskette into the diskette drive (drive A) in your computer. System program updates are available at <http://www.pc.ibm.com/support/> on the World Wide Web.
2. Turn on the computer. If it is on already, you must turn it off and back on again. The update begins.

---

### Recovering from a POST/BIOS update failure

If power to your computer is interrupted while POST/BIOS is being updated (flash update), your computer might not restart correctly. If this happens, follow the steps for "Erasing a lost or forgotten password (clearing CMOS)" on page 56.





---

## Appendix C. System address maps

The following charts represent how the hard disk stores different types of information. Address ranges and byte sizes are approximate.

---

### System memory map

The first 640 KB of system board RAM is mapped starting at address hex 00000000. A 256-byte area and a 1 KB area of this RAM are reserved for BIOS data. Memory can be mapped differently if POST detects an error.

Table 1. System memory map

Address range (decimal)	Address range (hex)	Size	Description
0 K – 512 KB	00000 – 7FFFF	512 KB	Conventional
512 K – 639 KB	80000 – 9FBFF	127 KB	Extended conventional
639 K – 640 KB	9FC00 – 9FFFF	1 KB	Extended BIOS data
640 K – 767 KB	A0000 – BFFFF	128 KB	Dynamic video memory display cache
768 K – 800 KB	C0000 – C7FFF	32 KB	Video ROM BIOS (shadowed)
800 K – 896 KB	C8000 – DFFFF	96 KB	PCI space, available to adapter ROMs
896 K – 1 MB	E0000 – FFFFF	128 KB	System ROM BIOS (main memory shadowed)
1 MB – 16 MB	1000000 – FFFFFFF	15 MB	PCI space
16 MB – 4096 MB	10000000 – FFDFFFFFF	4080 MB	PCI space (positive decode)
	FFFE0000 – FFFFFFFF	128 KB	System ROM BIOS

---

### I/O address map

The following table lists resource assignments for the I/O address map. Any addresses that are not shown are reserved.

Table 2. I/O address map

Address range (hex)	Size (bytes)	Description
0000 – 000F	16	DMA 1
0010 – 001F	16	General I/O locations, available to PCI bus
0020 – 0021	2	Interrupt controller 1
0022 – 003F	30	General I/O locations, available to PCI bus
0040 – 0043	4	Counter/timer 1
0044 – 00FF	28	General I/O locations, available to PCI bus
0060	1	Keyboard controller byte, reset IRQ
0061	1	System port B
0064	1	Keyboard controller, CMD/ATAT byte
0070, bit 7	1 bit	Enable NMI
0070, bits 6:0	6 bits	Real-time clock, address
0071	1	Real-time clock, data

Table 2. I/O address map (continued)

Address range (hex)	Size (bytes)	Description
0072	1 bit	Enable NMI
0072, bits 6:0	6 bits	RTC address
0073	1	RTC data
0080	1	POST checkpoint register during POST only
008F	1	Refresh page register
0080 – 008F	16	DMA page registers
0090 – 0091	15	General I/O locations, available to PCI bus
0092	1	PS/2 keyboard controller registers
0093 – 009F	15	General I/O locations
00A0 – 00A1	2	Interrupt controller 2
00A2 – 00BF	30	APM control
00C0 – 00DF	31	DMA 2
00E0 – 00EF	16	General I/O locations, available to PCI bus
00F0	1	Coprocessor error register
00F1 – 016F	127	General I/O locations, available to PCI bus
0170 – 0177	8	Secondary IDE channel
01F0 – 01F7	8	Primary IDE channel
0200 – 0207	8	MIDI/joystick port
0220 – 0227	8	Serial port 3 or 4
0228 – 0277	80	General I/O locations, available to PCI bus
0278 – 027F	8	LPT3
0280 – 02E7	102	Available
02E8 – 02EF	8	Serial port 3 or 4
02F8 – 02FF	8	COM2
0338 – 033F	8	Serial port 3 or 4
0340 – 036F	48	Available
0370 – 0371	2	IDE channel 1 command
0378 – 037F	8	LPT2
0380 – 03B3	52	Available
03B4 – 03B7	4	Video
03BA	1	Video
03BC – 03BE	16	LPT1
03C0 – 03CF	52	Video
03D4 – 03D7	16	Video
03DA	1	Video
03D0 – 03DF	11	Available
03E0 – 03E7	8	Available
03E8 – 03EF	8	COM3 or COM4
03F0 – 03F5	6	Diskette channel 1
03F6	1	Primary IDE channel command port

Table 2. I/O address map (continued)

Address range (hex)	Size (bytes)	Description
03F7 (Write)	1	Diskette channel 1 command
03F7, bit 7	1 bit	Diskette disk change channel
03F7, bits 6:0	7 bits	Primary IDE channel status port
03F8 – 03FF	8	COM1
0400 – 047F	128	Available
0480 – 048F	16	DMA channel high page registers
0490 – 0CF7	1912	Available
0CF8 – 0CFB	4	PCI configuration address register
0CFC – 0CFF	4	PCI configuration data register
LPTn + 400h	8	ECP port, LPTn base address + hex 400
OCF9	1	Turbo and reset control register
0D00 – FFFF	62207	Available

## DMA I/O address map

The following table lists resource assignments for the DMA address map. Any addresses that are not shown are reserved.

Table 3. DMA I/O address map

Address (hex)	Description	Bits	Byte pointer
0000	Channel 0, memory address register	00 – 15	Yes
0001	Channel 0, transfer count register	00 – 15	Yes
0002	Channel 1, memory address register	00 – 15	Yes
0003	Channel 1, transfer count register	00 – 15	Yes
0004	Channel 2, memory address register	00 – 15	Yes
0005	Channel 2, transfer count register	00 – 15	Yes
0006	Channel 3, memory address register	00 – 15	Yes
0007	Channel 3, transfer count register	00 – 15	Yes
0008	Channels 0–3, read status/write command register	00 – 07	
0009	Channels 0–3, write request register	00 – 02	
000A	Channels 0–3, write single mas register bits	00 – 02	
000B	Channels 0–3, mode register (write)	00 – 07	
000C	Channels 0–3, clear byte pointer (write)	N/A	
000D	Channels 0–3, master clear (write)/temp (read)	00 – 07	
000E	Channels 0-3, clear mask register (write)	00 – 03	
000F	Channels 0-3, write all mask register bits	00 – 03	
0081	Channel 2, page table address register	00 – 07	
0082	Channel 3, page table address register	00 – 07	
0083	Channel 1, page table address register	00 – 07	
0087	Channel 0, page table address register	00 – 07	
0089	Channel 6, page table address register	00 – 07	

Table 3. DMA I/O address map (continued)

Address (hex)	Description	Bits	Byte pointer
008A	Channel 7, page table address register	00 – 07	
008B	Channel 5, page table address register	00 – 07	
008F	Channel 4, page table address/refresh register	00 – 07	
00C0	Channel 4, memory address register	00 – 15	Yes
00C2	Channel 4, transfer count register	00 – 15	Yes
00C4	Channel 5, memory address register	00 – 15	Yes
00C6	Channel 5, transfer count register	00 – 15	Yes
00C8	Channel 6, memory address register	00 – 15	Yes
00CA	Channel 6, transfer count register	00 – 15	Yes
00CC	Channel 7, memory address register	00 – 15	Yes
00CE	Channel 7, transfer count register	00 – 15	Yes
00D0	Channels 4–7, read status/write command register	00 – 07	
00D2	Channels 4–7, write request register	00 – 02	
00D4	Channels 4–7, write single mask register bit	00 – 02	
00D6	Channels 4–7, mode register (write)	00 – 07	
00D8	Channels 4–7, clear byte pointer (write)	N/A	
00DA	Channels 4–7, master clear (write)/temp (read)	00 – 07	
00DC	Channels 4–7, clear mask register (write)	00 – 03	
00DE	Channels 4–7, write all mask register bits	00 – 03	
00DF	Channels 5–7, 8- or 16-bit mode select	00 – 07	

---

## Appendix D. Interrupt request and direct memory access channel assignments

The following tables list the IRQ and DMA channel assignments.

Table 4. IRQ channel assignments

IRQ	System resource
NMI	Critical system error
SMI	System-management interrupt for power management
0	Timer
1	Keyboard
2	Cascade interrupt from slave PIC
3	COM2 (some models only)
4	COM1
5	LPT2/audio (if present)
6	Diskette controller
7	LPT1
8	Real-time clock
9	Video, ACPI
10	MIDI/joystick (some models only)
11	Available to user
12	Mouse port
13	Math coprocessor
14	Primary IDE (if present)
15	Secondary IDE (if present)

**Note:** The default settings for COM 1 (IRQ 4), COM 2 (IRQ 3), and LPT 1 (IRQ 7) can be changed to another IRQ.

Table 5. DMA channel assignments

DMA channel	Data width	System resource
0	8 bits	Open
1	8 bits	Open
2	8 bits	Diskette drive
3	8 bits	Parallel port (for ECP or EPP)
4		Reserved (cascade channel)
5	16 bits	Open
6	16 bits	Open
7	16 bits	Open



---

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